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EDITORIAL.

THE PIG-IRON production of Germany in 1903 showed a large increase over that of 1902, and was over ten million tons, as we anticipated in our issue of January 7. The figures cabled for the total output are 10,085,634 metric tons, a gain of 1,682,974 tons. This total is 2,000,000 tons more than the output of the British furnaces last year, and puts Germany second only to the United States among the world's iron producers.

THE DEVELOPMENT of South Africa will be advanced by the successful test of the Wankie coal recently carried out on the Cape Government railway. It was found that the product of this new coal-field, in the heart of Rhodesia, compared in steaming quality with the best Welsh coal. The latter costs $36 per ton delivered at Kimberley, for example, while the cost of Wankie coal is $13 per ton. The successful opening up of these coal measures is sure to become a great factor in stimulating the industrial development of the mining regions which extend from the Zambesi to the Vaal.

THE PRESENT CONDITIONS of electro-metallurgy, as applied to the reduction of iron ores, are to be studied by Dr. Haanel, the Dominion Superintendent of Mines, on behalf of the Canadian Government. The object is to determine the possibility of utilizing some of the abundant water-powers of Canada in the reduction of the iron ores of western Ontario. Dr. Haanel is now on his way to Europe on this mission. The chief point to be determined is, of course, the economic one—whether electric smelting is practicable, given water-power at the lowest possible cost. It is doubtful whether the problem can be solved as yet; but an interesting report on the present development of electric smelting may be expected.

DIVIDEND PAYMENTS by the mining and metallurgical companies in the United States in January have been somewhat impaired by the change in the fiscal policy of certain large iron and steel corporations. Nevertheless, the total paid, $5,678,771, will attract attention, especial-

ly when it is learned that nine of the 49 companies reporting have returned since incorporation considerably more than their capitalization and are still among the largest dividend payers. Equally interesting is the fact that 34 metal mining and smelting companies have contributed $3,787,731, or about 67 per cent of the total dividends. This creditable showing has been partly due to the initial quarterly dividend of 1.25 per cent on the common stock of the American Smelting & Refining Company after four years' waiting; to the resumption of dividend payments by two large Lake copper mines, and to the extra declarations of several gold and quicksilver properties.

In addition to the above, six Mexican companies that have already paid back more than their share-capital reported $57,257, gold; and two Canadian concerns, $23,600 in dividends.

THE ENGINEERING BUILDING.

We regret to learn that the idea of a central engineering building, planned by Mr. Carnegie for the engineering societies of New York, is in danger of being abandoned, by reason of the disinclination of an active portion of the American Society of Civil Engineers to participate in the undertaking. This Society has already a good building of its own, with an excellent library and reading room. Moreover, as an association, it is rather more stringent in its qualifications for membership than the other technical societies, and many of the members are averse to the joint occupancy of a common building such as the Carnegie proposal contemplates. The matter will be decided by a letter-ballot to be canvassed at the next meeting of the Society, on March 2, and the result of the vote is of great importance for the particular reason that, unless all the societies included in Mr. Carnegie's gift decide to accept it, he will probably withdraw his proposal.

We do not care to criticise the views expressed by those of our friends among the civil engineers who are withholding their support to the proposal, and we fully appreciate the position which their Society occupies. Independence and exclusiveness are valuable factors in giving character to organizations of this kind, and we quite understand how some of the civil engineers may regard the more lax but generous regulations of kindred institutes, such as that of the mining engineers; but it is not contemplated to merge the societies, nor to consolidate their funds; nor indeed to take any step such as will rob any of them of a particle of their individuality. As against the minor disadvantages of sharing a large,well-equipped building with other organizations there must be balanced the gain to be derived from emphasizing the essential solidarity of the technical men and the opportunity to participate in an arrangement which will give greater dignity to engineering as represented in a community where every kind of engineering practice—mining not excepted—is helping to build the intricate foundations and the splendid superstructure of a great city and contributing in multitudinous ways to the advancement of life and industry in the entire country.

PYRITE SMELTING.

It is a pleasure to note that the discussion on sulphide smelting has been resumed with vigor. We publish to-day an interesting contribution from Mr. L. D. Godshall, and in next week's JOURNAL we shall have a valuable article from Mr. G. F. Beardsley, who has just come from Mt. Lyell, where Mr. Robert C. Sticht is doing such good metallurgical work.

Evidently there are valid objections to the use of the term 'raw sulphide' smelting, in describing the treatment of pyritic ores by the utilization of the combustible qualities of the sulphur and iron with a view to the production of a matte. Mr. W. R. Ingalls made the point that 'matte' smelting carried with it a reference to the product that is aimed at by the process; on the other hand, it is fair to say that 'pyritic' smelting suggests the kinds of ore susceptible of treatment; finally, 'raw sulphide' smelting describes the chemical condition of the material when sent to the furnace. Therefore it amounts to this, that the subject under discussion is the treatment of pyritic ores as raw sulphides with a view to the formation of a matte. To this may be added the corollary that matte is produced with the intent not only of extracting the copper, but also, and this is fully as important, of collecting the small quantity of precious metals occurring in the ores.

It is this last aspect of the inquiry that Mr. Godshall seeks to emphasize, and he also regards 'matte' smelting as a branch of 'pyritic' smelting; but this is scarcely an inference, because, as we have said, the one term refers to the material treated and the other to the product of that treatment; so they rank equally in descriptive value. The very fact that matte smelting may include the treatment of roasted ores does not make it more comprehensive, but, it seems to us, less definitive. Roasted ores are not a characteristic charge in this form of smelting, any more than the treatment of flue-dust is characteristic of ordinary blast furnace work; it is merely incidental.

'Sulphide' smelting, indeed, may seem to include the treatment of any sulphide, and, therefore, for example, the reverberatory smelting of galena or the reduction of cinnabar; 'matte smelting' fails to define the kind of smelting under discussion, because it covers the production of copper matte in reverberatory practice.

'Pyritic' smelting describes the type of ore treated; that is, the iron sulphides which have a combustible value. It includes not only iron pyrite, but also the lower sulphide, pyrrhotite, often termed magnetic pyrite; it includes not only chalcopyrite, but arsenical iron pyrite as well. Thus it covers the ores which are essential to and particularly adapted for this kind of smelting—an oxidizing fusion in a shaft-furnace. But 'pyritic' is wrong; we do not speak of a 'leady' or a 'zinky' smelting when describing the reduction of lead and zinc ores. The termination 'ic' should refer to the nature of the process, and that is not 'pyritic,' but matting—the conversion of ore into matte.

'Pyrite' smelting may be objected to as covering only common pyrite, that is, iron sulphide, whereas the process covers the treatment of all the pyrites, not only the common iron sulphides—pyrite and pyrrhotite—but also the related varieties characterized by copper and by arsenic. However, the employment of the singular to designate the type which it represents is a usage neither infrequent nor incorrect. Therefore, we finally arrive at the conclusion that the oxidizing smelting of pyrite ores in a shaft-furnace with a view to producing a matte is best labeled 'pyrite' smelting. We suggest the use of this term.

THE CONTAMINATION OF RIVER WATER BY COAL MINE REFUSE.

According to a Wilkes-Barre newspaper, some recent tests of the Susquehanna river water show results which are, at first sight, astonishing, and should prove of far-reaching importance.

As is well known, the coal mining companies in the anthracite regions have been often mulcted in damages for permitting the fine particles of coal and rock, or 'culm,' resulting from the mining and preparation of anthracite, to escape into streams. Many of the companies have been obliged to go to considerable expense in the construction of retaining dams and settling ponds, to allow the water from the breakers to precipitate all culm held in suspension. In addition to this, there has been complaint that the large percentage of sulphur compounds in the mine-water, due to decomposition of iron pyrite in the coal seams, has a deleterious effect on surface streams, and the companies have been threatened with suits from this cause. The steady increase in the population of communities situated along the streams flowing through the anthracite region, and the animosities that arise between these communities and the mining companies, either out of labor troubles or from attempts to make the companies pay higher taxes, have combined to render the situation for the companies more and more threatening.

The recently organized bureau of the United States Geological Survey, which is to consider such matters as water-supply, its contamination, etc., has taken up this question of river pollution by the anthracite coal mines, and it is to the results of the analyses made under the

direction of the Survey that attention is called here. It appears that while the acid mine-waters kill the fish and vegetable life in the streams, yet this disadvantage is offset by a great gain. The mine-water carries varying percentages of ferrous and aluminum sulphates and is thus an ideal precipitating agent, as the tests show. The Susquehanna river, just above the mouth of the Lackawanna, at the northern end of the Wyoming valley, contains a considerable proportion of organic matter. The Lackawanna river contributes a great amount of sewage from Scranton and other points northward to Carbondale, while below the mouth of the Lackawanna, Wilkes-Barre, Pittston, Kingston, Plymouth and Nanticoke also contribute sewage, and an unusual quantity of fine coal dust is turned into the stream. Such is the precipitating effect of the acid mine-waste that runs into the river, however, that the water contains less putrescible matter a short distance below Nanticoke, than it does 16 miles to the northeast, in spite of receiving the sewage of the cities named, having an aggregate population of 230,000. In addition, the fine coal dust is all precipitated except at periods of high water, and from a chemical standpoint the water is as good at Nanticoke as above the mouth of the Lackawanna.

This result at first sight seems astonishing, but water works' engineers know the value of these sulphates. The largest manufacturer of ferrous sulphate in the United States spends considerable money advertising its value as an agent for removing not only suspended inorganic matter, but also bacteria, from polluted stream water; and aluminum sulphate has long been used for precipitation and filtration plants for water-supply systems. It is hardly likely that the findings of the Survey will be refuted by any local authorities, intent on getting what they can from rich corporations. Hence this report should be worth ultimately hundreds of thousands of dollars to coal mining companies all over the United States.

PIG IRON PRODUCTION IN THE UNITED STATES.

The American Iron & Steel Association, with the promptness and thoroughness which we have learned to expect from its general manager, Mr. James M. Swank, has just compiled and published the complete statistics of pig iron production in the United States in 1903. The details of this statement are given on another page of this issue.

The total output of the blast furnaces last year was 18,009,252 tons of pig iron, an increase of 187,945 tons, or 1.1 per cent, over the previous year. Of the iron made last year, 9,707,367 tons were turned out in the first half of the year, and 8,301,885 tons in the second half. Had there been no check to activity the total for the year would have come close to 20,000,000 tons. The causes of the falling off have been frequently referred to in our columns, and no repetition is needed here.

In our issue of January 7 last we estimated the pig iron output for 1903 at 17,942,840 tons. The difference between this estimate and the complete official figures is 66,412 tons, or only 0.37 per cent. It was due to a slightly too conservative allowance for the furnaces which went out of blast in the month of December.

The production and approximate consumption of pig iron in the United States for two years past are shown in the following table:

	1902.	1903.	Changes.	
Stocks, Jan. 1....	70,647	49,951	D.	20,696
Production	17,821,307	18,009,252	I.	187,945
Imports	625,383	599,574	D.	25,809
Total	18,517,337	18,658,777	I.	141,440
Consumption	18,439,899	18,046,958	D.	392,941
Exports	27,487	20,381	D.	7,106
Total	18,467,386	18,067,339	D.	400,047
Stocks, Dec. 31..	49,951	591,438	I.	541,487
Consumption per capita	0.234	0.224	D.	0.010

The statement of stock on hand, it should be explained, includes all iron unsold; but it does not include iron made by steel companies and stored for their own use. Should these reserves be included, it is probable that the difference in approximate consumption would be somewhat greater than that shown above. There is no way of ascertainng such reserves exactly; but it is probable that they were greater at the close of 1903 than they were at the opening of the year.

The production of pig iron in the United States for twelve years past has been as follows, in long tons:

1892.....	9,157,000	1898.....	11,773,934
1893.....	7,124,502	1899.....	13,620,703
1894.....	6,657,388	1900.....	13,789,242
1895.....	9,446,308	1901.....	15,878,354
1896.....	8,623,127	1902.....	17,821,307
1897.....	9,652,680	1903.....	18,009,252

The production in 1892 exceeded that of any previous year. In the twelve years since then the total has nearly doubled.

Our total output of pig iron for two years, classed according to the uses for which it was intended, was as follows, in the long tons always used in the iron trade:

	1902.		1903.	
	Tons.	Per ct.	Tons.	Per ct.
Foundry and forge	5,176,568	29.1	5,785,957	32.1
Bessemer pig.....	10,393,168	58.3	9,989,908	55.5
Basic pig.....	2,038,590	11.4	2,040,726	11.3
Spiegel and ferro	212,981	1.2	192,761	1.1
Total.....	17,821,307	100.0	18,009,252	100.0

There is a slight discrepancy in this classification, and some iron reported by the furnaces under foundry and forge is used in making steel of various grades. This is due to the furnace reports, however, and not to the association.

Six States last year made over half a million tons each. In the order of their output these States were: Pennsylvania, 8,211,500; Ohio, 3,287,434; Illinois, 1,692,375; Alabama, 1,561,398; New York, 552,917; Virginia, 544,034 tons. Pennsylvania alone made 45.6 per cent of all the pig iron.

Classing the production by districts, in the order of their importance, we find that the output was as follows:

	Tons.	Per ct.
Central West	9,568,248	53.1
Seaboard and New England....	3,037,606	16.9
Southern States	2,900,856	16.1
Northwest	2,220,600	12.3
West of the Mississippi.....	281,942	1.6
Total	18,009,252	100.0

In this classification, western Pennsylvania and Ohio constitute the Central West; New York, New Jersey, eastern Pennsylvania and Maryland are included with the seaboard States; Illinois, Michigan, Wisconsin and Minnesota are in the Northwest. A further examination of this classification shows that between 70 and 75 per cent of our pig iron was made in districts using Lake Superior ores, either wholly or in part. The proportion of iron made on the seaboard was brought up last year by the large outputs in New York, New Jersey and Maryland. Some New York furnaces use local ores largely, as do those of New Jersey; while the Maryland furnaces run almost entirely on imported ores. The South uses local ores exclusively. The large production in New York last year was, however, chiefly due to the starting of the new furnaces of the Lackawanna Steel Company at Buffalo, which use Lake Superior ores.

The two years past—1902 and 1903—have formed a period of exceptional demand when iron brought a high price, and the making of it was profitable everywhere. They have not altered the tendency to centralize the manufacture of pig iron in the Central West and the Northwest—the region where Lake ores and cheap coke can be had; and in the South, where ores and fuel are close together. In the East and on the seaboard, in the long run, furnaces will prosper only under exceptional conditions; as at Port Henry, on Lake Champlain, and at Stanhope in New Jersey, where special ore supplies are available; or at the Maryland Steel Company's plant, near Baltimore, where Cuban ores are landed cheaply and a special market exists. The only hope for Eastern furnaces seems to be in the establishment of their own coke plants; in the saving of by-products from the coke, the slag and the like; in the utilization of waste gases; and in other economics to which the advance of metallurgical science may point the way.

MARKET CONDITIONS.

February 3.

The metal markets generally have been quiet, and there is little change to be reported.

In copper very little has been done, and the large consumers are apparently following a waiting policy, in the hopes of securing lower prices. European demand seems to have been satisfied for the present by the heavy buying done in December and January. On the other hand, it is reported that large holders have been pressing metal for sale abroad, at some concessions from current quotations; but apparently without immediate success.

The decision of the Montana Supreme Court in the McGinnis case, which is noted in our news columns, makes a point in favor of the Amalgamated Company in the long drawn out Butte litigation; that it will lead to any settlement of the whole trouble seems doubtful.

Tin has been quiet with a moderate business and fluctuations within rather narrow limits.

The business in lead has been about of the usual volume. Prices, however, are somewhat lower, the principal seller having reduced its quotations $2 per ton early in the week.

Spelter has been quiet, with only a moderate demand. Ore prices in the Joplin market remain about the same, but the production of ores has been reduced by stormy weather.

Silver is also rather quiet, without any great fluctuation in price. The demand for private account for India continues good, although coinage purchases are at an end for the time.

The iron markets continue uninteresting, buyers having apparently settled down again to a waiting policy. Some business has been done both in raw and finished materials, most of it probably at concessions, but is is difficult to ascertain the extent of these.

The Western coal trade shows an improvement, as far as factory demand is concerned. Transportation has been interrupted by cold and stormy weather, and this has resulted at some points in local scarcity and considerable inconvenience. The joint convention of miners and operators has shown no signs yet of coming to an agrement on the mining rate. It is not improbable that the Indiana and Illinois operators may draw out altogether and demand a separate agreement.

The Atlantic seaboard bituminous trade continues quiet, demand being unchanged, though the weather has interfered with shipments to some extent.

In the anthracite trade retail demand is active all over the country, and wholesale trade is generally good in consequence.

METALLICS.

Culled from all sources. Our readers are invited to assist this department by sending similar material.

The first discovery of coal in the United States recorded in history was in 1679, at a locality near the present city of Ottawa, Ill.

Holland possesses only a very small coalfield, situated on the Belgian frontier. In 1902 there were four mines in operation, and the production was 400,000 tons.

Herbert Spencer opposed the introduction into England of the metric system. In a codicil added to his will he reiterated his objection to the metric system and expressed the desire that, whenever a bill should be introduced in Parliament on the subject, his pamphlet against the system should be reprinted by his executors and distributed to the members of both Houses.

Tin is said to have been found in ore from the Cariboo district, British Columbia. It has been found in a greisen dike at Lost River, near Nome, Alaska.

The mineral production of British Columbia in the half century from 1852 to the close of 1902 amounted in value to $189,728,538. The chief items in the total are gold aggregating $64,627,683, and coal and coke with an aggregate of $58,989,572. The largest output in any one year was in 1901, when the total value reached $20,086,780.

The introduction of machinery at a mine presupposes the certainty of abundance of work to be done in the mine, as well as suitability of the machinery for the work, and proper installation. Without these prerequisites machinery cannot be profitable. While special machines are found in all branches of mining, hoisting and haulage are pre-eminently the mechanical departments.

COAL IN MEXICO.*

By EDWARD W. PARKER.

The Mexican government does not collect any official statistics for minerals other than those carrying the precious metals. The figures given below, for the production of coal in Mexico in the year 1902, have been chiefly collected by Mr. Edwin Ludlow, general manager of the Mexican Coal & Coke Company. According to his information, which is assumed to be fairly complete, the total production of coal in the Republic in 1902 was 709,654 metric tons, equivalent to 782,252 short tons. This coal was produced by three companies: The Coahuila Coal & Coke Company, reporting 282,000 metric tons; the Fuente Coal Company, 82,600 tons; and the Mexican Coal & Coke Company, 395,054 tons.

The production of coke during the year was 71,710 metric tons. The Coahuila Coal Company made 18,700 tons; this company owns 120 ovens, of which 60 were in operation during the year. The Mexican Coal & Coke Company produced 53,010 tons of coke; it has 226 ovens, of which 200 were in operation at the close of the year.

The workable coal-fields of Mexico, from which any production has so far been obtained, are almost entirely in the eastern part of Coahuila. The first company to operate in this region was the Sabinas Coal Mines Company, which began in 1884, but in 1887 was succeeded by the Coahuila Coal Company. The Alamo Coal Company began operations in March, 1888, and was followed by the Fuente Coal Company in 1894. The controlling interest in all these companies was owned by the late C. P. Huntington, and the mines were operated in connection with the Mexican International Railroad. The total output of these mines to the close of 1902 is estimated at 3,854,000 metric tons. The next company to begin operations was the Mexican Coal & Coke Company, which was organized by New York parties in 1889, and secured control of Las Esperanzas coalfield. The company built a branch 10 miles long from Barroteran, on the Mexican International, about 90 miles south of Eagle Pass, to the mines. Shipments began in June, 1900, and from that time until the close of 1902 the company mined a total of 694,946 metric tons, of which 571,552 tons were sold, and 123,394 tons were converted into 72,407 tons of coke. Of this coke, 2,271 tons were exported to the United States, being sold to foundries in Texas and smelters in Arizona.

The northern coal-field, in which the Fuente mines are situated, produces a good gas coal carrying about 40 per cent of volatile combustible matter. This coal-field apparently extends down the valley of the Rio Grande, as the same quality of coal is mined near Laredo, Texas, and is found across the river on the Mexican side. The other coal-field worked is in the valley of the Sabinas river, about 80 miles west of Eagle Pass, and contains the Sabinas and Las Esperanzas basins. In the former the vein is from 3 to 4 ft. thick, and is worked by the Coahuila Coal Company. Las Esperanzas basin lies further to the west, and is controlled by the Mexican Coal & Coke Company. The vein there is from 8 to 9 ft. thick. In both basins the coal is good coking coal, but requires to be separated from the slate and bone, which are found in stratified bands running through the coal. Both basins are extensive.

In other parts of Mexico coal has been discovered, especially in Sonora. At one point in that State a peculiar formation has been developed, caused by the coal deposits being metamorphosed by volcanic action. Anthracite coal is found in the anticline; natural coke on the sides of the basin, and graphite in the syncline. Nothing has been done in this field, on account of the lack of transportation. In the State of Jalisco there are large deposits of lignite, which is, however, of a friable nature and will not stand transportation. Coal has also been found in Guerrero and Puebla, but no single deposit has been discovered of sufficient size to warrant the building of a railroad to carry the output.

The demand for coal in Mexico is increasing with the number of smelters and manufacturing establishments. In 1902 there were 761,938 metric tons of coal and 175,395 tons of coke imported; and these figures do not include the coal and coke brought into Sonora for the use of the mines and smelters at Cananea and Nacozari. The imports given above came from the United States, chiefly from the mines of the Indian Territory, through Laredo or Ciudad Juarez; about one-third of the total imports being received in this way. The balance was imported through Tampico and Vera Cruz. Formerly, most of the coal received at those ports came from West Virginia and Alabama, but during 1902 prices of both coal and coke in the United States were high, and it was difficult to get orders filled, so that a large quantity was brought from Germany, Belgium and Great Britain. It will be difficult for the United States to recover this trade.

*Abstract from article in 'Mineral Resources of the United States for 1902.' From advance proofs.

AMERICAN INSTITUTE OF MINING ENGINEERS.

As announced in the Secretary's latest circular, the next meeting will take place at Baltimore, beginning Tuesday evening, February 16. The sessions will be held at the Belvedere Hotel, except one meeting at Johns Hopkins University. A large number of interesting papers is announced; they deal mainly with the metallurgy of iron and steel, and should attract members from Philadelphia and Pittsburg.

DISCUSSION.

Readers are invited to use this department for the discussion of questions arising in technical practice or suggested by articles appearing in the ENGINEERING AND MINING JOURNAL.

A CORRECTION.

The Editor:

Sir.—In an article by Charles H. Fulton in your issue of January 7, page 34, lines 24 to 26, the following statement is made: "The Smuggler-Union tried a process . . . (for the regeneration of waste cyanide solutions) . . . for some time, which, however, has recently been omitted from the mill scheme."

This obviously refers to the Davis regeneration process, the patent covering which is owned by Mrs. A. L. Collins, jointly with Messrs. F. L. Bosqui and W. H. Davis. The statement is entirely without foundation, and, as you will readily understand, is likely to do considerable harm to their interests. I shall be obliged if you will give prominence, in your next issue, to a correction of it.

To avoid the possibility of a misunderstanding, I wrote to Mr. Bulkeley Wells, the general manager of the Smuggler-Union mines, directly my attention was called to the statement in question; and his reply explicitly authorizes me to state that the Davis process is, and has been continuously, in use at the Smuggler-Union plant, and that he has no intention of discontinuing it. GEORGE E. COLLINS.

Denver, Jan. 25, 1904.

A BUREAU OF MINING.

The Editor:

Sir.—Your timely editorial, 'A Bureau of Mining,' is a move in the right direction, and should meet with the unqualified approval of the mining profession.

Those who have had occasion during the past few years to note the progress and workings of the United States Geological Survey, have been not a little chagrined to see the original object and true mission of the Survey, "to facilitate the distribution of accurate information regarding the mines and mineral resources of the country and their economic development," relegated to an unobtrusive place in the extreme rear and a minor part of recent innovations pushed to the front without regard to the protests of the mining world. Verily, it is a case of the tail wagging the dog.

The act of Congress June 17, 1902, provided that all returns from the sale of public lands should be deposited as a separate fund to be loaned for the construction of irrigation works.

The hydrographic division of the United States Geological Survey was put in charge of the reclamation works of the government, and, regardless of the fact that this division was given an appropriation of $200,000 per annum for hiring engineers for the purpose of carrying out the provisions of this law, the Secretary of the Interior has permitted the use of a large sum from this special fund by the hydrographic division for the same purpose. This action has, of course, given the hydrographic division a much larger fund than any other division could possibly hope to secure, and accounts for the relegation of necessary geological and topographical work to the background, as these less fortunate divisions have co-operated with the reclamation service to their own detriment.

In the past year's work all the government engineers I have met have been either directly in the reclamation service or indirectly under its orders, though nominally connected with other divisions. Many other engineers say the same thing and express their desire that a properly organized division of mining, distinct from other divisions, should be established to carry on the legitimate work of the Survey, independent of present dominating influences.

The value of the former work of the Survey to the mining world can hardly be computed, and, should it be possible to again carry on the work of the Survey on the lines mentioned in your editorial, the mining world would cooperate most enthusiastically, where now only indifference is shown, and the busy engineer would gladly avail himself of the detailed information contained in the Survey folios to facilitate his own work and promote the general progress of the mining world.

A shake-up and complete reorganization of the whole Survey would be a blessing in several ways, and would certainly meet with the approval of the business world.

HENRY C. BEELER.*

Cheyenne, Wyo., Jan. 18, 1904.

The Editor:

Sir.—The editorial entitled 'A Bureau of Mining' should cause concerted action upon the part of all interested in the mining industry. A careful perusal will disclose much written between the lines, and find it to be a mild but merited rebuke, especially to the mining engineers of the Western States. It also, after an impartial portrayal of conditions, suggests a remedy—the establishment of a Mining Bureau under the general supervision of the Director of the United States Geological Survey.

In this connection, the mining engineer occupies a somewhat paradoxical position. He, of all others, best appreciates the value of the geological reports of the Survey, the importance of having this work continued, and is supposed, for selfish reasons, if none other, to at all times lend his influence and support to that which will best promote the mining industry. Yet your editorial states that the Geological Survey was created in 1879 with two general divisions, General and Mining Geology; that the declared policy of the first chief of the department was to make economic geology the prominent feature of the Survey work; that at the present time the Survey "is a complex organization, and includes five main branches. . . . It has culminated in a clumsy grouping of different departments, and the final subordination of economic geology . . . to a minor department."

The importance of the mining industry is well established. All, however, directly or indirectly, engaged in mining, appreciate that sooner or later the present fields of operation will be depleted, and the future of the industry will depend upon new districts yet to be developed. An accurate and complete geological report, with maps of these new sections, is an undertaking beyond the ability of individual enterprise. Again, these reports should be absolutely impartial, and emanate from a source as far as possible removed from individual interest or concern. In the future, as in the past, the prospector will doubtless blaze the trail for the hardy miner, and new districts, of which there are many in the West, will eventually receive the necessary financial aid to demonstrate their commercial merit. With the assistance of the Geological Survey, the same results may be attained in a much shorter period of time, and with far less risk upon the part of the investing public.

To no one factor do Colorado and other Western States owe more for their rapid advance and development than to the United States Geological Survey. This statement may be discredited by a few mining engineers, but before doing so they should carefully determine whether or not their present knowledge of certain sections was not originally based upon former determinations of the Survey, and whether or not mining would have the same standing as a legitimate industry had it not received the recognition it has by the Survey.

The exogeneous growth of the Geological Survey is due to the active work of interested parties in the various branches now existing, who, through their representatives in Congress, have been able to gain recognition. Likewise, the subordination of economic geology to its present minor position is due to the lack of active work upon the part of interested parties through their representatives in Congress. There is little room for doubt that had the mining engineers been as persistent and unanimous in their demands for legislation and appropriations necessary to maintain the original position assigned economic geology, as they have been in obtaining, free of cost, the publications of the Survey, the present conditions would not exist.

The mining engineers, therefore, may very properly be charged not only with gross neglect of the interests of an industry for which they presume to stand sponsor, but, indirectly, of their own personal welfare. Their sin, however, is one of omission, rather than commission, and is largely due to a general aversion to anything pertaining to politics or political methods. Unfortunately, perhaps, all departments of government are more or less dependent upon political results, or upon the interest shown in the departments by the senators and representatives elected, who hold their seats by virtue of political parties. When elected and seated, their manifested interest in certain branches or departments is largely due to the expressed wishes or demands of their constituents.

Your editorial is doubtless the result of careful consideration, and the suggestion of a mining bureau as therein set forth is deemed the most advisable course to pursue. The name of this new branch is, however, of little importance. The object to be accomplished is to create and establish a branch that may be made the object of special appropriation. The re-arrangement or re-adjustment of an established department of government is dependent upon legislative enactment and fraught with danger. The wisdom, therefore, of attempting to again bring economic geology to the front and to accord with the intent of the original act creating the department, is largely dependent upon the active support that may be granted such a move by those interested in the mining industry. Heretofore organized effort has not been possible. But if your JOURNAL will assume the burden of leadership and secure the support of its numerous readers;

*State Geologist of Wyoming.

if each, as an individual, will urge the advisability upon all their senators and representatives; if the various engineering societies will lend their influence as societies; if it can be made a pull, a hard pull, and a pull altogether, along the lines you have suggested—there can be but little doubt as to the ultimate result. To this end, therefore, you may enroll me upon your list of volunteers. HARRY A. LEE.*

Denver, Colo., Jan. 16, 1904.

The Editor:

Sir.—Your timely editorial on the needs of the Geological Survey must certainly receive the hearty endorsement of the entire mining engineering profession, and of that still larger body of men to whom, as investors in mines, economic geology has come to be appreciated as of the highest practical importance.

To an outsider it appears that the crippled condition of the Geological Survey, as at present organized, offers an opportunity for brilliant men to emerge into prominence without affording those attractions which will keep them in the harness for the public welfare when they have begun to feel their power. No organization can in itself cause the Geological Survey to perform the best functions of which it is capable. It is the men in the service who, by arduous labor, by unselfish devotion to the work, and through natural talent of the highest order, have brought the Geological Survey into such prominence as one of the powerful factors in promoting the intelligent development of the resources of our country. The suggestions made in your editorial, if followed out, would apparently tend to make the Survey attractive to the best talent as a place in which to exercise it fittingly in a life-work.

If exception was to be taken to your argument at any point, it might be with reference to technological studies. Monographs presenting the status at any time of the leading industries dependent upon the mineral resources are as important for promoting progress as discussions concerning the resources themselves. It is not given to all men to investigate the varying methods prevalent throughout the entire country. Those who do enjoy such opportunities are, as a rule, too busy to write books. They may write articles, and do their part toward the general progress of the profession—often suppressing the newest and most interesting features in obedience to the dictates of that conservative spirit so strong in the trained engineer—but the broad review of the subject is precisely what we do not get. An occasional college professor accumulates data for a great treatise after long years of toil and impoverishing expense, and sends his work to the printer, painfully conscious that much which he has gathered has suffered some eclipse by newer methods. Were the Geological Survey to embrace such studies, specialists could be found ready to improve such opportunities, and, aided by the resources which would thus be placed at their command, could, within reasonable time, bring out works of the highest value to the professions involved and to the general public.

Assuming that it was your conviction that original investigations of a technical character should not be undertaken by the Geological Survey, little could be urged against your position, but a simple presentation of the actual state of the art in various important mineral industries would seem to be a natural corollary to a discussion of the bases upon which those industries were founded.

COURTENAY DE KALB.

Mojave, Cal., Jan. 18, 1904.

*Late Commissioner of Mines of Colorado.

PYRITE SMELTING.

The Editor:

Sir.—The discussion of this subject by different metallurgists cannot help but be of importance equal to, if not greater, than, the recent interesting and valuable discussions on mine sampling and ore deposition.

The subject at the present time seems to be in a condition somewhat similar to that of the cyanide process at the time of its early introduction into this country. During the last ten years much has been written upon the subject of pyritic smelting. Many plants have been put in operation and a record of failures has resulted fully equal to that of the early attempts at cyanidation. Until quite recently it has been very difficult to obtain reliable information of actual results secured in practical work. Most extravagant claims have frequently been made, and are still forthcoming, concerning the superiority of this method of smelting over any other. On the other hand, important improvements and discoveries have also been made during recent years.

We have, therefore, on account of these advances and in spite of many failures, every reason to hope that in the near future matte smelting, together with its modification, pyritic smelting, will become as important in fire metallurgy as cyanidation is now in the wet treatment of ores.

In order to bring out as full a discussion on this subject as possible I shall criticize rather freely such statements and claims as in my opinion are either not borne out by experience or else not sufficiently clearly presented to be correctly understood. I shall also call attention to some statements and results obtained which, in my opinion, are of the greatest importance. Certain statements and data have been taken from a publication or catalogue issued by the Colorado Iron Works, of Denver, the accuracy of which has, however, been vouched for by Mr. J. W. Nesmith, president of the company.

In this connection I wish to say that I am seeking for reliable information, no matter whether obtained from practical furnace foremen, who have never seen the inside of a technical institution; reliable manufacturers of smelting machinery, perhaps equally devoid of technical training but constantly in touch with metallurgists and smelting men in many different localities and working under as many different conditions; highly educated but practically inexperienced professors of metallurgy or practically experienced and technically trained metallurgists.

Your editorial in the issue of October 10 defines the above subject as follows: "Raw sulphide smelting may be defined as the treatment of unroasted sulphide ores with a view to the formation of a matte." And "Raw sulphide smelting is based upon the utilization of the heat derived from the combustion of sulphide ores in a blast furnace *in contradistinction* to the heat obtained directly from carbonaceous fuel." (The italics are mine.)

You appear to object to the well-known terms pyritic smelting and matte smelting, claiming that these terms do not cover the ground. The former is said to omit pyrrhotite ores and the latter to include roasted ores. These objections, it seems to me, are due altogether to the view one takes of the scope of the terms used. As I understand the term, 'pyritic smelting,' pyrrhotite ores are not omitted, while the fact that matte smelting does include the treatment of roasted ores should be in its favor, as being more comprehensive.

Mr. Ingalls notes some objections to the term 'raw sulphide' smelting. These I consider well taken. In my opinion, however, he has omitted to state some of the strongest objections. Among these are the conditions governing the smelting of various ores where the contents in sulphur are so low that it becomes necessary to maintain a reducing atmosphere in smelting, in order to prevent the small amount of sulphur present from being oxidized and to obtain the copper in a matte form and at the same time to produce enough of the latter to collect the gold and silver values present in the ore.

If the definition and basis of utilization of heat be accepted as above given, we can at this time have only a modfication of 'raw sulphide' smelting in America, because at no place, so far as I know, is carbonaceous fuel entirely eliminated.

In order to induce further discussion on this point, therefore, I make the following suggestions: To stick to our old terms of "lead smelting,' 'copper smelting,' and 'matte smelting.' We are all familiar with the many different variations in the processes of the two former and let us accept and define those of the latter. It is true that copper smelting gradually merges into matte smelting, but the latter covers more cases universally regarded as distinct from copper smelting than either 'pyritic' or 'raw sulphide' smelting.

I would suggest that the definition and basis be somewhat changed to read as follows: *Matte smelting may be defined as the treatment of various ores with a view to collecting the different values by means of a matte produced;* and, *Matte smelting is based upon the utilization of the heat derived from combustion of sulphide ores in a blast-furnace, in addition to the heat obtained directly from carbonaceous fuel.* The basis, as here stated, therefore, includes such variations as will result from the minimum of heat derived from the combustion of sulphide ores in the case of roasted ores, and raw ores very low in sulphur contents, to the maximum of heat derived from such combustion in the case of heavy raw sulphide ores, as smelted at Mt. Lyell, Salt Lake, and other places.

Pyritic smelting now becomes a branch or part of matte smelting and may be defined as follows: *Pyritic smelting is a form of matte smelting whereby the maximum amount of heat is derived from the combustion of heavy raw sulphide ore in a blast-furnace, in addition to the minimum amount of necessary heat obtained directly from carbonaceous fuel.*

All types of ore, suitable for copper smelting, are equally so for matte smelting, with the possible exception of high-grade oxidized ores of copper under conditions suitable for direct smelting to black copper. In addition to the above, all kinds of dry ores, together with ores carrying a limited amount of lead and zinc, the limit of the former being a

question of commercial value of the lead lost as compared with the cheaper reduction of the other metals contained in the ore.

The limit of the zinc ought to be such that, when mixed with the charge the normal amount of ZnO contained in the slag shall be about 8 per cent, with a maximum of 10 per cent. Higher zinc slags have been run according to Mr. Ingalls, but in the opinion of the writer any increase on the above percentages will bring many difficulties in connection with the operation of the furnace in addition to a largely decreased capacity resulting therefrom.

The amount of sulphur on the charge may vary from the maximum amount present with the iron as FeS_2 to a minimum of 3 per cent, provided the percentage of copper remains slightly less.

So far as I know there are to-day no slags made by matte or pyritic smelters which are not closely or exactly duplicated by the copper smelters. This kind of smelting is therefore not distinct from copper smelting on account of any difference in the slags to be obtained, but it is rather a process using a greater variety of ores and obtaining similar slags with different methods.

The question of the advisability of using a hot blast is a most important one; and, in addition to its importance, there is at the present time also the greatest difference of opinion as to its economy among metallurgists engaged in this branch of smelting. In order to discuss this question intelligently it is necessary to start from a common understanding of the word "advisable." In my opinion in this connection it must mean that it is more *economical* and therefore more *profitable* to use a hot than a cold blast in smelting.

With the claims and evidence for and against this proposition, it becomes necessary to study closely the conditions present as well as the results obtained in connection with both cases.

Very strong claims have been made by hot blast advocates concerning its superiority over cold blast. Koch[1] claims that a blast of 200° C. produced cleaner slags with wider range and smother work. Mathewson[1] claims that hot blast will produce higher grade matte, or, in other words, that it will oxidize more sulphur than its equivalent of cold blast. Austin[2] claims it is advantageous in smelting a silicious or infusible charge. Bretherton[3] cites many advantages, among them, increased capacity of furnace, saving of fuel, brighter tuyeres, smoother running of furnace, largely increased limit of zinc and arsenic on charge by reason of its stronger oxidizing action, and concludes with the statement that hot blast reduces the cost of smelting nearly half on heavy sulphide ore. Lloyd[4] claims increased capacity, stronger oxidizing action, and that it is cheaper to heat the blast before it enters the furnace than to heat it in the furnace with coke. J. W. Nesmith, as a manufacturer of blast-furnaces, claims two points in favor of the hot blast: A saving of at least 10 per cent in the cost of the fuel used per ton of ore smelted and an increased smelting capacity of at least 25 per cent.

The claims above enumerated in favor of the hot blast cannot be ignored. If only a part of them can be substantiated, the value of the hot blast must be admitted.

The evidence on the opposite side is mainly of a negative character and consists principally in a failure on the part of metallurgists of note to find the merits claimed for the hot blast. Carpenter[5] says he "has never found the magic in mere hot air that others have professed to find." Pre-eminently the greatest exponent of the hot blast is Sticht in his practical experience at Mt. Lyell, where he is using it with such unqualified success. In contrast with his experience, we have that of Nutting, at the Bingham smelter at Salt Lake, and Carpenter at Deadwood. The former is working under conditions as nearly identical with those at Mt. Lyell as it is possible to find; the latter, at Deadwood, under conditions as widely different. Both use cold blast, and the scope and commercial success of Nutting apparently is on an equality with that at Mt. Lyell. In addition to the practical experience of these two prominent operators, we have that of Butte, where hot blast has been tried without apparent success. An examination of the actual results obtained at different plants using the hot and cold blast now becomes interesting.

In all cases, so far as I know, where heavy raw sulphide ores, low in copper, are smelted without a preliminary roasting, a double smelting is required in order to obtain a matte sufficiently high in copper, say from 45 to 50 per cent, for converter purposes. This applies alike to hot and cold blast smelting. At Mt. Lyell the grade of the first matte is said not to exceed 15 per cent copper, being a concentration of about seven tons of original ore into one ton of matte. Higher grade first mattes are being produced at other places, but with a lower percentage of sulphur on the charge. At the Bingham plant at Salt Lake, where the character of the charge is similar, but cold blast is used, I have been informed from unofficial sources that the grade of the first matte is also about 15 per cent copper.

The products of the hot and cold blast do not therefore seem to show any great difference, from which we may conclude that on certain classes of ore the oxidizing action of the hot blast does not seem to exceed that of the cold blast. On ores containing appreciable quantities of zinc, lead, arsenic or antimony, or on first mattes, where the sulphur is less easily oxidized, more information is necessary before any definite decision on the relative efficiency in oxidizing action between the hot and cold blast can be reached. Bretherton claims to have obtained a higher oxidizing action with the hot blast in connection with zinc sulphide, but gives no figures. He also states that the elimination of arsenic so far has not been successfully accomplished with cold blast.

The last statement requires modification, as it is well known how simple and easy it is to volatilize the arsenic when present as arsenical pyrite. The writer has even added speiss in large quantity and in large pieces to matte smelting charges, using cold blast under oxidizing conditions, without discovering any evidence of the presence of arsenic in the matte produced. The speiss in question had been produced in lead smelting. The writer never having had any practical experience in hot blast smelting, has no direct evidence of his own to offer on this point. Practical results obtained in the concentration of first matte by hot and cold blast smelting would shed considerable light on the subject. Until such information is forthcoming, it seems as if the greater oxidizing action claimed for the hot blast is yet unproved.

The comparative furnace capacity is difficult to determine. We have so many cases of phenomenal capacity obtained with the cold blast, both in copper and in matte smelting, that it is difficult to imagine any greater efficiency with the aid of the hot blast. Mr. Paul Johnson, the pioneer in copper and matte smelting in British Columbia, obtained, at Nelson and in the Boundary district, results in capacity with the cold blast not excelled at any place with the hot blast. Mr. Robert Hedley, who succeeded Mr. Johnson at Nelson, has been equally successful with cold blast work. The slags made here were, moreover, what are usually termed highly silicious, containing about 42 per cent silica, and from 15 to 20 per cent alumina, the charge containing but from 2 to 5 per cent copper, besides some silver and gold. The matte produced in one smelting assayed from 45 to 50 per cent copper, the slags from 0.2 to 0.3 per cent in copper, and as clean from silver and gold as in lower concentration. The capacity of the furnace was frequently in excess of 300 tons per day and seldom below 250 tons.

At Butte and Great Falls, as well as at other places, capacities with the cold blast are being obtained which are not exceeded anywhere by the hot blast.

According to recent reports, Mr. Johnson is now putting in hot blast in a new smelter he is erecting on the northwest coast, where the conditions are somewhat different from those where he formerly operated in British Columbia.

Mr. J. W. Nesmith gives the results of a test run made at Silverton, Colo., at the matte smelter formerly owned by Thomas F. Walsh, the metallurgist in charge being E. W. Walter.

The following are the results:

Cold blast.		Hot blast, 700° F.
90 hours.....	Duration of test	72 hours.
104 tons.....	Charges per 24 hours	150 tons.
300 lb.....	Coke used per charge	150 lb.
7 into 1....	Degree of concentration ...	7 into 1.
$109.20	..... Cost of coke	$78.75
	Cost of heating hot blast.....	34.50
	Total cost for fuel.....	$113.25

The above figures are of great value as illustrating three important points: Capacity, fuel required in furnace, and oxidation of sulphur. The smelting capacity is so clearly in favor of the hot blast for this particular charge that the inference naturally follows that there may be many other cases where such capacity must be equally favored by the aid of it, but it does not necessarily follow that all ores will show such a variation between hot and cold blast smelting.

Economy in fuel is as important a factor as capacity in smelting. The saving in coke brought about by the external heating of the blast must exceed the actual expense of such external heating in order to become an economical advantage. Some writers speak of such saving of coke as self evident, but it must be remembered that in heating the blast inside of the furnace by means of coke alone, all of the heat contained in the latter is utilized. In the case of the external application of heat to the blast, cheaper fuel is available; but, on the other hand, heavy losses in heat occur by radiation and otherwise.

Where fuel, cheap in comparison with coke, can be obtained, and the mechanical appliances are so perfected as to utilize the greatest pos-

[1]This JOURNAL, October 10, 1903.
[2]The same, October 24, 1903.
[3]The same, October 31, 1903.
[4]The same, November 28, 1903.
[5]This JOURNAL, November 7, 1903.

sible amount of heat contained in such fuel, there ought to be no question of the economy of the hot blast so far as the fuel question is concerned. On the other hand, where the difference between the cost of coke and other fuels is not so marked, the economy, in fuel, of the externally heated blast is very materially lessened, and may in some cases become doubtful.

The experience at the Silverton smelter, as shown by the above data, leaves no doubt in that case as to the economy of the hot blast. In that test, using cold blast, 390 charges were smelted at a total cost for fuel of $109.20 while with the hot blast, 450 charges were smelted at a cost of $113.25. The weight of the charge is not given, but, judging from the weight of charges given in connection with other data, it probably was from 2,000 to 2,500 lb. It will therefore be readily seen that in this case the total fuel required for the hot blast test cost but $4 more than that for the cold blast, and for this extra expenditure of $4 more than 60 tons of additional charge were smelted. The importance of the proved advantage of the hot blast in some instances should make the subject of sufficient interest to all metallurgists to give it their most careful consideration and study; for that which to-day is a success, under certain limited conditions, may to-morrow be improved and its use widely extended.

The consumption of coke in hot or cold blast smelting varies according to the amount of sulphur present in the charge. The following figures are given as representing the approximate percentages used under different conditions:

	Per cent.
Mt. Lyell, with hot blast and double smelting; coke used per ton ore smelted	6
Bingham, Utah, with cold blast and double smelting; estimated coke consumption of ore smelted	10
Butte, Mont., single smelting, with cold blast and partly roasted ore	10 to 11
British Columbia, single smelting, with cold blast and raw ore low in copper and sulphur	12 to 13

In all of the above cases, the grade of the matte to be on basis of 45 to 50 per cent copper, and percentage of coke based on ore smelted.

In a note contained in this JOURNAL of May 30, 1903, Mr. Alfred Miller makes the statement that coke had recently been entirely eliminated in the raw ore smelting at Mt. Lyell, and in addition to the above innovation the hot blast, which had been found in previous experience to be "obligatory and not to be circumvented" had been lowered in temperature and that in No. 1 plant, both ore and matte were now being smelted with cold blast. This marks such a change and improvement over past experience that additional information on the subject would prove of very great interest.

The relative economy of the different methods of matte smelting at present in use is a most difficult question to determine.

The competing methods adapted to the smelting of sulphide ore charges carrying small percentages of copper are as follows:

1. The hot blast, double smelting process for raw ores.
2. The cold blast, double smelting process for raw ores.
3. The cold blast, single smelting process, requiring a preliminary roasting of all or part of the heavy sulphide ore treated.
4. The reverberatory process, requiring a preliminary roasting.

According to some of the literature on pyritic smelting there is only one way to smelt heavy pyritic ores and the expense of that method is so extremely low that no other method can possibly compare with it. To show the fallacy of such claims without further argument it is merely necessary to point to two notable instances: The Highland Boy smelter at Salt Lake, treating heavy pyritic ore, containing a low percentage of copper and very small quantities of gold and silver, and the Argo smelter at Denver, treating heavy pyritic ores and concentrates low in copper, but frequently high in gold and silver. The fact that the latter stands to-day as the result of development from the old Welsh process, which was crude and primitive when first introduced into this country by Mr. Richard Pearce, while the former is a modern reverberatory furnace plant erected but a few years and designed by a noted copper metallurgist, denotes that reverberatory practice is still a healthy rival of the blast furnace methods.

The long-continued success of both also gives weight to the argument. The important discoveries and developments made in connection with and bearing upon the different methods of matte smelting may be summed up as follows:

1. Direct smelting of heavy raw sulphide ores, with either hot or cold blast, and oxidizing a sufficient amount of sulphur to provide the necessary iron oxide for fluxing purposes.
2. Concentration of copper in matte so produced, by a second direct smelting to approximately 50 per cent copper, thereby rendering it suitable for converting without any previous roasting.
3. Important improvements and developments in mechanical roasting furnaces, whereby the cost of roasting has been greatly reduced, thereby lessening the cost of copper smelting and matte smelting as distinguished from pyritic smelting.
4. Important improvements and developments in water concentration, greatly reducing the losses formerly sustained, thereby lessening the advantages of direct smelting of the crude ore.
5. The successful application of the hot blast with its decreased amount of coke required for smelting.

It is not likely that the accuracy of the above statements will be questioned by any of the metallurgists, however widely they may differ on many other points. The first four statements are self-evident; the fifth, without any further explanation, might be objected to as not stating the whole proposition, because it sets aside, for the moment, the question of the relative economy of hot, as against cold, blast. Those who deny the economy of the hot blast are, however, forced to admit that it is practical. For this reason the question of economy is omitted from the statement.

In determining the questions of the relative economy of the different methods, it is always necessary to take into consideration the character of the ore, both chemically and physically, the cost of supplies and the cost and character of fuel and labor.

Some of the writers on this subject make a great point of the advantage of direct smelting without roasting, but neglect to take into consideration the cost and disadvantage of a second smelting of the first matte produced. They also overlook the improvements recently made in modern mechanical roasting furnaces, whereby the heat from the burning sulphur is utilized and fuel almost eliminated, reducing the cost of roasting to a minimum. In many instances there are very distinct advantages to be derived in the single smelting preceded by the roasting of heavy sulphide ores. Where copper ores are scarce, but necessary for making clean slag, a preliminary roasting will produce a much higher concentration and therefore higher grade copper matte, which means a correspondingly smaller amount of copper on the charge. Where copper ores are brought from a distance and smelted at a loss merely for the sake of the copper, to produce clean slags, such difference might change failure into success. Where appreciable quantities of zinc sulphide accompany the ore a preliminary roasting will be of the very highest importance, as pointed out by Mr. Ingalls. Zinc-blende is one of the most difficult minerals to oxidize, and if put in the furnace raw, in large quantities, it will check the smelting capacity, form crusts of sublimated zinc sulphide along the furnace walls and derange the operation of the furnace generally. Part will be oxidized and enter the slag as ZnO, and the balance will be found distributed partly in the slag and partly in the matte, in both cases in a dissolved state, and still another part will be found floating away in the slag like mushy ice or snow in water. Under such conditions clean slags are next to impossible to obtain, while with a preliminary roasting most of the zinc will enter the slag as ZnO producing cleaner slags and avoiding the mechanical troubles of the blast-furnace. In addition high zinc slags invariably require a heavy percentage of iron, and render therefore the usually profitable and always desirable high silica slags an impossibility.

Messrs. Carpenter and Lang both advocate the direct smelting, without concentration, of Butte ores, but if we take into consideration that these ores by analysis show the following composition: SiO_2 58 per cent; Fe, 12 per cent; S, 17 per cent; Cu, 4 per cent, it becomes apparent at once that such smelting would be exceedingly costly by reason of the excessive amount of fluxes and fuel required and it seems to the writer that it would be better to first demonstrate the advantage, if there be any, of smelting the present Butte charge raw or without any previous roasting. If it cannot be demonstrated that the low silica and high sulphur, under such conditions, can be smelted more advantageously raw than it is now being done, it would seem to be still much more difficult to demonstrate the advantage of smelting, raw, the low-grade mill ore, which is much higher in silica and correspondingly lower in sulphur.

In conclusion the writer wishes to suggest that there is one field not yet entered by matte smelting which, in his opinion, deserves attention; that of smelting dry ores by matte smelting as against lead smelting, in central localities like Denver and Pueblo in Colorado, and the Salt Lake valley in Utah. Matte smelting under such conditions should be carried on by one smelting to produce 45 to 50 per cent copper matte, and all heavy sulphide ores should be roasted. Under such conditions we would have the following advantages as compared with lead smelting:

Slags comparatively clean.

High, instead of low, silica slags.

Capacity of matte furnace nearly twice that of lead furnace.

Result, very much lower cost per ton of ore smelted.

L. D. GODSHALL.

Denver, Colo., Dec. 20, 1903.

AN ALL CAST-IRON TURN-TABLE.

By Jas. C. Bennett.*

Through the courtesy of our superintendent, I am enabled to present a description of a turn-table for industrial tracks, which was designed for the purpose of increasing the efficiency and lessening the cost, as compared with those formerly in use.

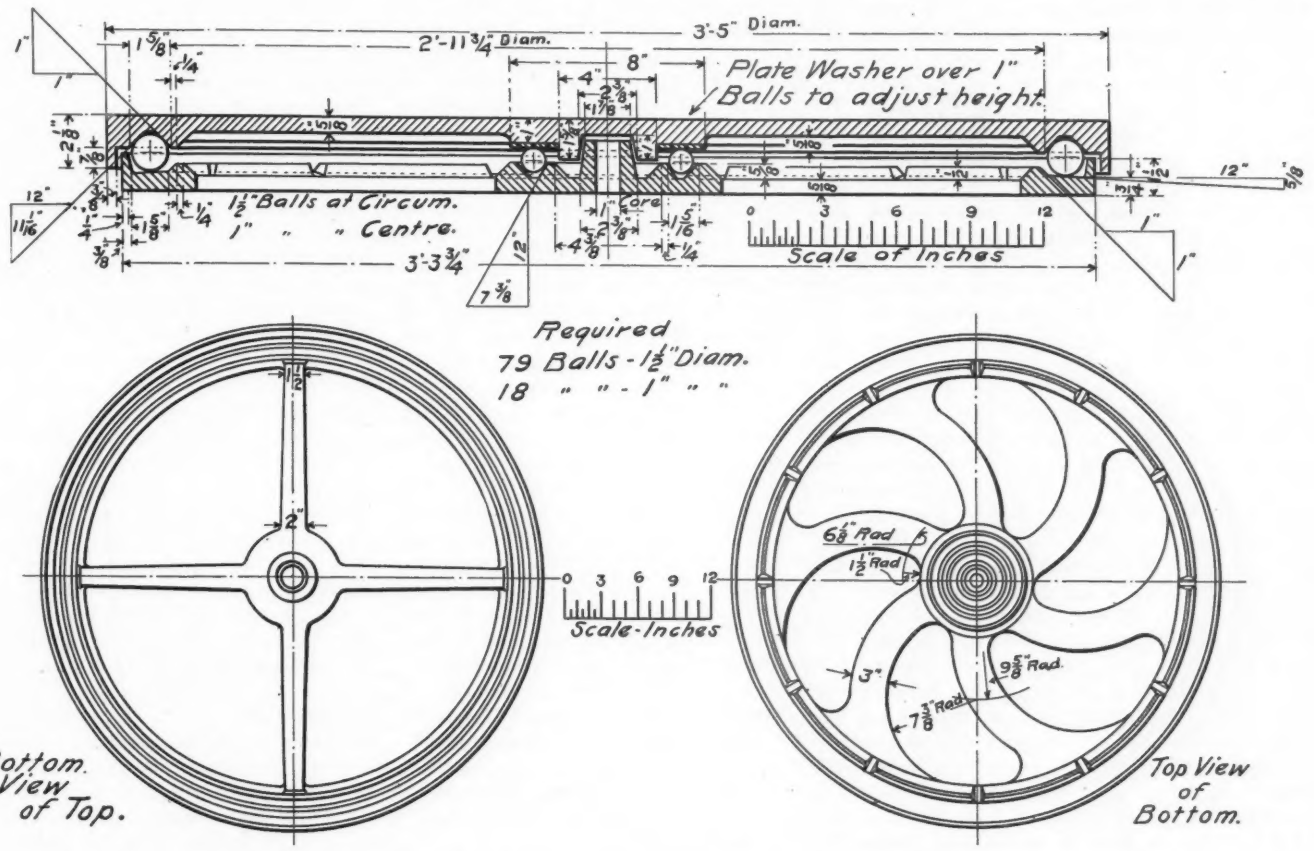
For the sake of comparison, a brief description of the original table may be desirable. It was composed of top and bottom plates, central pin and six conical turn steel rollers, turning in babbitted bearings cast on the bottom plates. The roller-track, on the under side of the top plate, was originally same size in the present table. It was found, however, to turn very hard, save under a heavy load. The inner ball-race and balls were introduced to carry the weight, and the outer race thus became an idler—to steady the table while the load is moving on or off and to assist the inner race in case of an unbalanced load. The cut washer above the 1-in. balls is for the purpose of adjustment. Experience has shown that the best results are obtained by using a washer thick enough to barely take the load off of the outer race when the load is balanced. Owing to the lack of uniformity in castings, washers of varying thicknesses are found necessary. It will be noticed that the table will allow of a considerable tipping without binding, the central pin being merely to keep the top central with the bottom.

The bottom-plate is cast with arms, for the double purpose of lightening the casting and of permitting the table to drain itself when submerged. The small openings on the inner ridge of the lower ball race are also for the purpose of self-cleansing.

With the exception of the cut washer and dressing the gates off the balls, which are used just as they are cast, there is no machine work required on the table. It is used in conjunction with a 20-in. gauge track of 16-lb. rail, standard section, the longest wheel base being 24 inches.

In placing the table, the top is set half an inch below the top of the rail, which latter is bent out to a radius of 3 in., to act as a guide for starting the car onto the track. The wheel-flanges carry the weight while on the table. The setting consists of a base of two thicknesses of 1-in. boards, laid across one another on well tamped and level earth, and a coping of 2-in. plank, cut to a radius slightly larger than the lower part, and whose inner edges are champfered off to admit the top. Two or three spikes are driven into the base, against the arms, to prevent the bottom plates turning. It will be noticed that the top of the table is perfectly flat. The first one was made with a camber of ¾ in. diameter, but it was found to render it hard to keep the car central while turning the table.

The first table of the present pattern was put into service on December 1, 1902, and is still in constant use, having had no repairs and showing but slight wear. The average total weight of the loaded cars is about 5,000 lb.,



CAST-IRON TURN-TABLE, 20-IN. GAUGE, SELBY SMELTING & LEAD COMPANY.

machined. This, however, was replaced later by a chilled track, which gave very satisfactory service, save that the tops cracked rather too frequently, apparently on account of the internal strains produced by the chilling. The first tables, furnished complete by the builders, cost $31 each. On substituting the chilled track for the machined one, and doing our own machine-work, the cost was reduced to $24. As there was a considerable amount of wear on the roller, and as the central pin seemed to cause the table to turn very hard under a slightly unbalanced load, there seemed room for further improvements. It may be noted that in the table just described the entire load was carried on the central pin, the rollers being simply idlers.

The table shown in the accompanying drawing is the outcome of efforts toward improvement. The first attempt comprised a table with but one set of 1½-in. balls near the periphery, corresponding to the balls of the but not infrequently a loaded car weighing 6,000 lb. is turned. To date, January 1, 1904, there are 95 tables of this style in use, and they are replacing the old ones as fast as conditions require. No accurate account has been kept of the total number employed, but it is probably about three hundred. The larger number are out of doors, and during the rainy season frequently stand in water for 24 hours with no apparent ill effects. All the attention required is an occasional sweeping out with a broom and a little oil on the ball-races. This latter is probably not entirely necessary, but owing to unevenness in the balls it is found to be of some benefit. Attention may be called to the fact that it was found necessary to give the foundry men especial directions to secure a smooth ball-race on both top and bottom plates. The races are not chilled. The average total weight is 496 lb., divided up as follows: Bottom, 160 lb.; top, 290 lb.; 78 balls, 1.5 in. diameter, 43 lb.; eight balls, 1 in. diameter, 3 lb., which, at 3.5c. per lb., the average price on this coast, will make the total cost of the table, exclusive of cut washer and

*Engineering Department of the Selby Smelting & Lead Company, California.

dressing the balls, $17.36. Owing to the liability of wooden patterns to warp, cast-iron patterns are used for top and bottom and nests of brass for the balls. The precaution pertaining to the ball-race also applies to the balls, in order that a reasonably true ball may be secured.

LEADVILLE ZINC ORE PRODUCTION.

By Walter Renton Ingalls.

The shipments of zinc ore from the Leadville district in Colorado during the year 1903 were probably in the neighborhood of 100,000 tons. According to the statement given by the special correspondent of the ENGINEERING AND MINING JOURNAL, in the issue of January 14, the shipments in 1903 amounted to 80,213 tons, of which the Iron Silver Mining Company produced 65,713; the Yak Tunnel, 1,260; the R. A. M., 3,740; the Louisville, 2,500, and the Western Mining Company, 3,500. This statement is incomplete, since it includes only a very small proportion of the shipments of the Western Mining Company (Minnie and A. M. W. mines), which is the largest producer after the Iron Silver Mining Company.

The bulk of the zinc ore produced in Leadville comes from the sulphide extensions of the main ore-shoot in Carbonate Hill and the Eastern ore-shoot in Iron Hill. The latter extends through the Minnie and the Col. Sellers mines, passing from the latter into the Moyer mine of the Iron Silver Mining Company. The ore-body now shown in the Moyer mine is said to be 1,600 ft. in length, with an average width of 300 ft. and thickness ranging from 4 to 125 ft. The ore is classified as (1) lead; (2) lead and zinc; (3) zinc, assaying as high as 40 per cent Zn; (4) pyrite, non-cupriferous; and (5) pyrite, cupriferous. All of the ore is argentiferous and the pyrite is apt to carry a little gold. The various classes exist separately to a certain extent in the mine. The Moyer mine is now producing about 325 tons of ore per day, of which about one-third is broken out clean enough for shipment as it comes. The remainder is separated by hand-sorting, which is done on stationary tables, at each of which two men work, throwing the ore into cars standing conveniently near by. Each man sorts about 11 to 12 tons per day, which makes the cost less than 30c. per ton.

The ore raised from the Minnie mine is not of so high grade in zinc. It is concentrated by crushing in Huntington mills and washing on Wilfley tables. The ore-slimes are conducted into bins lined with burlap, through which the water filters out. This has proved to be a very good arrangement for handling these slimes, loss of which is thereby avoided.

The Leadville zinc ore is shipped partly to domestic smelters and partly to European works. The exportation to Europe was not so large in 1903 as in previous years. A considerable quantity of the Leadville ore is shipped to Cañon City and Denver, Colo., where there are mills equipped with magnetic separators. These mills make a higher grade of concentrates than the ordinary wet-crushing mills, but the cost of the process is considerably higher. At the best, the Leadville zinc ore, on account of its high iron content, is a comparatively inferior smelting material, but under the conditions of production and market there is a fair profit in it for both miner and smelter.

THE DECLINE OF METALLURGICAL ENTERPRISE IN ENGLAND.

By Henry F. Collins.

As regards the metallurgy of iron and steel, it may probably be said that the leading English works are fully abreast of the times, and have adopted nearly all the improvements of demonstrated value with reference alike to appliances, methods and operative details. It is, however, well known to every competent observer that, in other branches of metallurgy, both the practice and the development of the art have been for many years past almost at a standstill. With the exception of lead and silver refining, of the wet extraction of copper from burnt pyrites, and of a few special electro-chemical processes of minor interest, there is hardly a branch of metallurgical industry in which English practice can be regarded as standard, or in which any substantial improvements in methods and appliances or economies in working-costs have been effected for many years past.

The copper-smelting industry is a case in point. Up to thirty years ago, Swansea might have been called the metropolis of the copper-smelting industry of the world. To it converged, in one form or another, the bulk of the copper supplies from all quarters of the globe, either in the form of ores, of mattes, or precipitates and bars worked up to such stages in the various countries of origin. In those days its practice, alike in ore-smelting, in silver extraction and in electrolytic refining, could be regarded as fully up to date, and in every respect standard. To-day, however, three-fourths of the copper works of South Wales stand idle and dismantled, while the remainder—with the exception of the Cwm Afon works of the Rio Tinto Company and the Britton Ferry works of the Cape Copper Company, which are devoted entirely to bringing into a marketable form the product of their respective groups of mines—are, in the strictest sense of the word, stagnant and unprofitable businesses, eking out a miserable existence chiefly by the purchase and treatment of odd lots of silver and gold ores from South America and Australia.

What are the causes of this decline of a once great industry? One contributory cause, undoubtedly, is the falling off in home supplies of ore, and the concurrent development of vast deposits in America and elsewhere, which have forced Swansea from her position of a practical monopolist, sure of custom, and over-disdainful and independent in dealing with customers, into that of a needy competitor in the open market, with no special advantages to boast of beyond long knowledge of the business. In no field of enterprise is "long knowledge of the business," pure and simple, a less valuable asset than in copper and silver smelting, for in no branch of industry have conditions, methods and appliances been so radically transformed during the past twenty years as in the smelting of ores of copper and the precious metals. Up to twenty years ago, most copper ores were still smelted either in small reverberatory furnaces, or in brick or water-jacketed blast-furnaces of small capacity and high fuel consumption; in either case mechanical appliances for the handling of matte and slag were unknown, and economy of labor was not keenly sought after, or, indeed, considered possible. Under such conditions, Swansea, with its natural advantages of cheap fuel, cheap fire-brick and cheap skilled labor, did what was regarded in those days as cheap and good work. The direction of operations was usually in the hands of a so-called "practical smelter," whose father, and perhaps grandfather, had been in the business before him, whose only rule was the rule of thumb, and who was generally unable to predict how any particular ore would behave in the furnace without trying it, although long experience would enable him to judge some new ores by their appearance and general superficial resemblance to others, the behavior of which was known. It would have been considered, in those days, little short of madness to entrust the making up of charges to a man who knew nothing of the ores beyond their chemical composition; indeed, little was then known of the scientific calculation of charges to give certain slags, or even of what slags were desirable; and such little information on the subject as was available, chiefly through the writings of certain German metallurgists, was beyond the ken of the managers at South Wales smelteries, who, mostly ignorant themselves of chemistry, were, as a rule, assisted by a 'chemist' at the munificent salary of about £3 or £4 per week. More rarely the head chemist would have partial direction of the works, when he might earn as much as £400 or £450 per annum; even then, however, he never had absolute responsibility as superintendent or technical director of all departments of the work, but was invariably hampered by the head refiner, the head mason, and other more or less important officials, all of whom were in practice semi-independent of his control, and all of whom could, at any rate, be safely relied upon to resist to the uttermost any innovation emanating from the works' chemist, and to tacitly encourage the men under their orders to do likewise. Under the Swansea system no trained man ever had a free hand to remodel works or to radically reorganize the system of working; nor was any first-class technical man ever offered such a salary, position, or interest in the business as would induce him to identify himself with the works and devote himself *con amore* to the task of clearing away the obstructions in his path. There have been at different times connected with South Wales smelting works first-class men like Richard Pearce, afterward of Denver, and they have done what they could until they became disheartened, but none of such men ever had inducement enough to stay there permanently.

The decline in the smelting industry of South Wales is, in the writer's opinion, due simply to the fact that owners of Welsh smelting works have stood still, and continued to utilize, with slight modifications, their antique plant and appliances, out-of-date system of handling, and rule-of-thumb management; whereas, in every important metallurgical center in America, works have been entirely rebuilt or remodeled several times over during that period, and the entire direction of operations is in the hands of men who combine wide theoretical knowledge and engineering ability with practical training under modern conditions. No one who has not actually seen the present condition of a South Wales smelting plant can have any idea of the small capacity of the ridiculous little furnaces employed, of the complexity of the series of operations followed, of the heavy cost for fuel and repairs, or—most important of all—of the

enormous daily expense for labor, not only in attending the furnaces, but still more in transporting materials from point to point. Just as the best thing that could have happened to the El Paso plant of the American Smelting & Refining Company, at El Paso, Tex., was its total destruction by fire some two and a half years ago, so the cheapest thing, in the long run, for the proprietors of some of the works in South Wales which could be mentioned would be to dynamite the whole works, with some slight exceptions, and make a fresh start, with some approach to a definite preliminary design, and a carefully considered system of handling materials and products throughout the various stages with as little loss of time and as little expenditure of labor as possible.

Some few improvements, indeed, have been made in recent years. Thus, the introduction of the direct process by Nicholls, at Britton Ferry, was a distinct advance, and, in view of the prevailing cheapness of labor and fuel, this alternative to bessemerization, elsewhere and under other circumstances well-nigh universal, is certainly preferable for use under English conditions; at all events (*a*), where the mattes are low in precious metals, and so free from deleterious substances, such as lead, copper and bismuth, as to be capable of producing a good grade of refined copper direct from a 75 per cent regulus, as at Britton Ferry; and (*b*) where mattes of high precious metal contents are to be worked up to anodes, as at Burry Port.

With this exception, however, improvements at Swansea, particularly in regard to the appliances and mode of handling materials, have been quite partial and mostly confined to the roasting arrangements. Thus, another leading works in South Wales some few years ago tore out its calcining department, which previously had been equipped only with single-hearth reverberatories of primeval type, and put in one Brown horseshoe and two Brown-O'Harra straight-line furnaces. These have, of course, been an unqualified success, and the saving over the system previously in vogue is immense; yet under local exceptional conditions of cheap skilled labor, allowing for repairs, depreciation and amortization, it is probable that the saving in working-costs realized by these mechanical furnaces over those realizable by means of a properly arranged roaster house, containing long 4-hearth hand reverberatories of the usual American type, would have been inconsiderable; while the saving in capital outlay (which was probably so great as to deter the owners from further improvements) would have then sufficed to make some much-needed alterations in other parts of the works. It is in just such problems as these that the judgment of the trained metallurgist, who has been accustomed to consider local conditions and to look at all the various sides of a problem, finds its opportunity. Apart from the direct process, and from the roasting department, there are few innovations to record. Nowhere in South Wales have large reverberatories of the Argo or Montana types been given a trial; nowhere can there be found at work a modern blast-furnace (that is, one working at a high blast pressure and consequent high efficiency per sq. ft. of hearth area); nowhere is there anything like a good system of handling material, wheel-barrows being in use on all sides, and nowhere are the various departments so arranged as to secure a minimum of handling.

As to the class of management, very little improvement has been made, in spite of the fact that, for modern conditions, it is no longer sufficient that the works' manager should be a chemist or an experienced furnace-foreman. The metallurgist nowadays must combine both these qualifications with two others even more essential: he must be an engineer, and he must have that trained appreciation of costs and that clear discrimination of the directions in which economies can be effected, by means of suitable organization, which is characteristic of the successful administrator in all branches of industry. A happy union of these various qualifications is not easy to find, except among men who have had long experience in executive positions in North America or Australia, as it would seem that the environment of South Wales does not favor the development of such a combination. Furthermore, the mere fact of having had foreign experience is by no means sufficient, unless coupled with a thorough preliminary theoretical training, without which it is hardly possible to draw correct inferences from observed facts, or to make adequate use of acquired practical experience. To illustrate this point, an incident which occurred only three or four years ago may be cited. The technical manager of one of the best known of the Welsh smelting plants, a shrewd man in many ways, who had had long experience abroad of a rule-of-thumb character and was considered an authority on the subject, but who was not a properly trained man, was consulted as to the probable smelting behavior of a copper ore submitted to him for examination, the gangue of which was principally garnet containing approximately silica, 40 per cent; ferrous oxide, 20 per cent; lime, 30 per cent, and alumina, 10 per cent. After recommending that iron flux should be used, if possible (which, under the peculiar circumstances of the case, was out of the question), would it be believed that this 'expert' actually recommended that, in the absence of iron flux, a simple bi-silicate of lime containing 50 per cent of silica, and in itself infusible, should be added, in order to "flux the garnet!" It is evident that this expert was ignorant of the principles underlying the formation of slags and their fusibility, upon which, among other factors, largely depends the economic success or failure of every important customs smelting plant.

To this day the management of an important Welsh plant uses purple ore (calcined pyrite) as flux in its slag-cleaning cupolas, for cleaning slags containing copper and the precious metals which are already far too heavy in iron, and it would, indeed, seem as if no Welsh smelter had the least conception of the essential function played by lime in decreasing the specific gravity and increasing the fusibility of ferruginous slags.

From a consideration of all the above facts, it would appear that the prime cause of the decline in the South Wales smelting industry has been the apathy and want of business enterprise of the proprietors of the works, that is, of the great families identified with the smelting industry. The founders of those families accumulated large fortunes from smelting in the days when the miner's ignorance of the real value of his ore enabled one well-known works to recover, during a comparatively few years, over £60,000 worth of silver, for which they never paid one penny, out of the copper ores from a single Cornish mine; and when supplies of furnace material were so abundant, and competition so limited, that even the worst conceivable arrangement of plant, and the most entire disregard of economy of labor and fuel, failed to reduce substantially the profits realizable from the smelting business by anyone who had capital enough to engage in it. Their successors, when competition became keener owing to the adoption of more modern methods elsewhere, were unable to realize that arrangements which had served well enough for a capacity of 100 tons per day, treated at such exorbitant aggregate charges as to yield a profit of perhaps £1 per ton smelted, over and above extravagant total costs, amounting to perhaps £2 per ton smelted, could not be made to serve for modern conditions, under which the smelter is required to treat ores containing the precious metals at a total average cost for smelting and refining of not over, say, 15 shillings to £1 per ton smelted, and to be satisfied with a net profit of only 5 shillings per ton, which, of course, involves increasing the daily quantity treated from 100 tons to at least 500 or 600 tons per day, in order to attain such lower figures of cost. They have also been unable to realize that the attainment of such low costs per ton as would enable them to compete with leading works abroad is impossible without a complete remodeling of their whole plant, and that successful operation of a custom smelting plant in face of active and intelligent competition is only possible if the entire technical direction is in the hands of a thoroughly competent metallurgical engineer, either as general manager or as consulting engineer. It is probable that the great opportunity has been lost, and that the palmy days of Welsh smelting have passed away forever; but even now there are such large quantities of ores, mattes, etc., which, owing to better facilities of transport and to other circumstances, are practically bound to come to England, that a modern, well-designed works of a capacity of 500 tons per day, and provided with sufficient floating capital to carry necessary stocks, would find an ample field for its operation, and, under competent management, would become a very profitable business.

THE ELMORE COPPER WORKS AT SCHLADERN.—The electrolytic copper-tube works at Schladern, Germany, employing the Elmore process, are turning out about 1,500,000 kg. of copper tubes a year (*Oesterreichische Zeitschrift für Berg u. Hüttenwesen*, December 19, 1903). The precipitation is effected in lead-lined wooden boxes, 6 m. long by 2 m. broad, the bottoms of which are first covered to a depth of 200 mm. with granulated copper, and which are then filled with a solution of copper sulphate containing 3 per cent of free sulphuric acid. Each box is provided with one or more horizontal spindles placed about 30 mm. above the layer of granulated copper, which receive a rotary motion from a shaft under the boxes. The electric current is transmitted to the metallic copper, passes through the solution to the spindles and is then conducted to the next box in the series. The current strength averages 200 amperes at from 40 to 50 volts. All sizes of tubes up to 2.5 m. in diameter and 6 m. long are made. They are said to be remarkably uniform as regards strength, and are fully equal in this respect to cold-bored tubes.

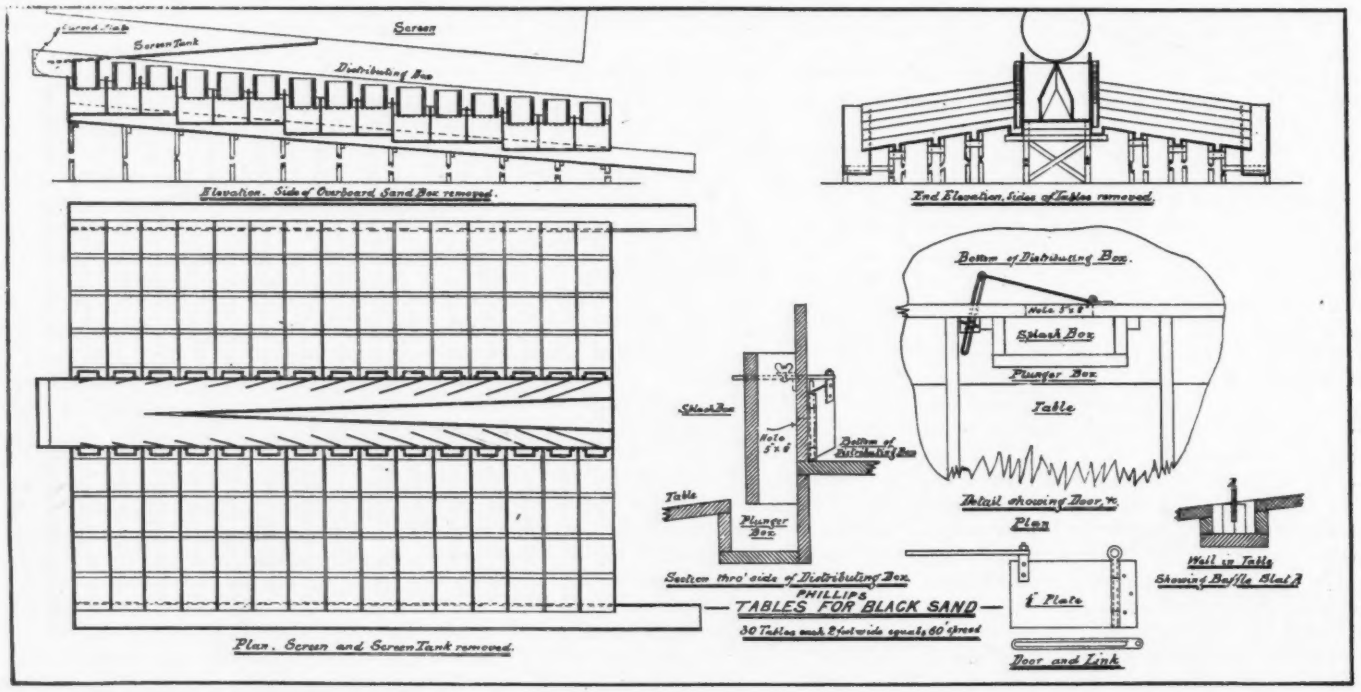
GOLD SAVING ON DREDGES.*

By J. P. SMITH.

As soon as it was realized that gold-dredging on the coast would become an established industry, the ingenuity of inventors was exercised to design efficient tables, that could be erected on the limited space available on the deck of a dredge. The first step in the evolution of the modern table was the introduction of what was known as Jones' patent on the Waipuna, Grey River and other machines. This was an improvement on the Otago appliances, and consisted of the addition to the ordinary tables of distributors and mixing wells, the latter being generally known as 'boil-boxes.' It is only fair to state that at a sluicing claim at Barrytown, where a littoral deposit containing large quantities of black sand and very fine gold was being successfully dealt with, the mixing of the pulp in quantity and its even distribution over the tables had been accomplished long before. To deal with sands in quantity on dry land, where space is of no consequence and the quantity of water available only limited by the means of the operator, is very different from treating large quantities successfully in the available space on the pontoons of a dredge, where the supply of water depends upon the size of the pump or the power of the engine. But when once the principles governing the mixing and distribution of the sands had been learned, the evolution of the present tables was rapid. The latest improvements suggested by experience are embodied in Phillips' black-sand tables, diagrams of which accompany this paper.

Phillips' tables are working on the North Beach dredge, a machine dealing with a littoral deposit of sand and shingle. The gold is very finely divided and associated with large quantities of black iron-sand (magnetite and ilmenite). The sand is saved with the gold, and afterward separated by amalgamation. If any loss of gold occurs over Phillips' table, it is not due to any want of efficiency of the tables, but from the failure of the pump to lift the quantity of water required to keep the strakes free from gravel, and this will always be liable to occur as long as a separate engine is not provided to drive the pump alone. As the quantity of sand passed over the tables is governed by the size of the perforations in the screen, and there are no other means by which it can be regulated, there will always be a varying quantity of solid matter in the pulp. No two cubic yards of gravel in a working-face can be relied upon to contain equal quantities of fine material of less than 1 in. in diameter, the size of the largest perforations in many screens. Where the ground consists of alternate layers of sand and shingle, the quantity of fine material varies with nearly every bucket discharged. In creek beds and flats there are occasional deposits of fine drift resting directly on the auriferous wash and lifted with it, which for a time largely increases the quantity of solid matter passing over the tables. When dredging through ground of this loose nature, the tendency is for the face to fall in freely to the buckets, with the result that all of the buckets come up full, and sometimes piled up. Now, material of this description packs closer in the buckets, and consequently the weight of the ladder is largely increased. On a machine where the engine under normal conditions is working at its maximum efficiency, which is often the case, the additional load at once reduces the speed. The lifting capacity of a centrifugal pump varies with the number of revolutions it makes within certain limits, so that the effect of the reduced speed is a diminished supply of water just at the moment when the largest quantity of solid matter is passing over the tables. If gold is lost over the Phillips tables, it is under these abnormal, but frequently occurring, conditions, and no tables will ever be designed to prevent this loss until the pump is driven by a separate engine instead of by a belt from the main engine.

*Abstract from Annual Report of the New Zealand Department of Mines for 1903.



NATIVE GOLD ORIGINAL IN METAMORPHIC GNEISSES.

By J. E. SPURR.

In the JOURNAL of October 3, 1903, I gave the results of a microscopic study of the gold-bearing dioritic rock from Mashonaland, Africa, originally described by Mr. E. D. Berrington. He found the rock composed of hornblende, feldspar (oligoclase-albite), quartz and some biotite, with magnetite and epidote. In this rock was abundant gold, original and crystallized contemporaneously with the other minerals, but more closely associated with the basic constituents—hornblende and magnetite. It was pointed out, nevertheless, that the rock was metamorphic rather than directly igneous, and belong to the crystalline gneisses; and, therefore, that the contained gold could not be explained as due, in its present condition, to magmatic differentiation. Attention was also called to the similar phenomena observed by Dr. A. C. Spencer and myself in the copper districts of Encampment, Wyoming and Pearl, Colorado, where diorite gneisses, almost exactly like the auriferous Mashonaland gneiss, contain original chalcopyrite, blende and galena (besides pyrite, pyrrhotite, etc.), intercrystallized and contemporaneous with hornblende, feldspar and occasional quartz.

I have just received from my teacher and friend, Professor M. A. Lacroix, a publication[1] in which he finds the following note on Madagascar gold (translated):

"The origin of the Madagascar gold is rather obscure. The auriferous quartz veins which have been definitely recognized are few in number, and those found do not correspond with the relative richness in gold of many of the districts of the island. On the other hand, it had long seemed probable to me, judging from the stories of prospectors, that the gold occurs in place in the undisturbed but decomposed rock resulting from the alteration of the crystalline schists. I have succeeded in demonstrating this hypothesis by the study of

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Weathering describes the changes of rocks, near the surface, in cohesion and composition, due to the decomposing and oxidizing action of percolating waters.

[1]'Notice sur les Travaux Scientifiques de M. A. Lacroix,' Paris, April, 1903, p. 21.

a magnetite-bearing quartzite and a granulitic[2] gneiss from Belambo; in these, free gold is found as a constituent mineral; it is in good crystal, included in all the rock-forming minerals—in the micas, the feldspars, and the quartz. It must be admitted that it is contemporaneous with these minerals."

This, then, makes a third authentic case of the occurrence of the rarer metallic minerals as original constituents of crystalline gneisses.

Concerning the derivation of the gold, previous to the formation of the gneisses, however, we are still in doubt. In referring to the Encampment district, I remarked in my article in this JOURNAL, already referred to: "Some of these hornblende gneisses or metamorphic diorites have been shown to have been derived by metamorphism from an igneous gabbro, and it is probable that during the process of metamorphism some migration and segregation of metals, originally disseminated in the igneous rock, has taken place."

Professor Lacroix adds to his above translated statement the following: "Several observations made in other regions, notably the demonstration of the existence of free gold along the cleavage-planes of the granulitized mica schists near Nantes and in the tin veins of Limousin,[3] lead me to the conclusion that the gold has been formed in Madagascar by the emanations of the granitic magma, which has so profoundly impregnated the crystalline schists of the island."

CORRUGATED SHEET IRON.—Corrugated sheet iron or steel for mill-building construction should always be ordered to cover two purlins or girts, if possible. Sheets of No. 22 gauge or lighter can be bent in the field, but heavier metal should always be bent at the mill. In estimating the quantity of material required, allow 25 per cent for laps where a side-lap of two corrugations and an end-lap of 6 in. are required, and allow 15 per cent for laps where a side-lap of one corrugation and an end-lap of 4 in. are required. Prices for black and galvanized sheet iron are to be found in the trade publications. For corrugated sheet iron or steel add 0.05c. per lb. to the net cost per lb. for flat sheets; for painting with red oxide of iron add 0.1c. per lb.; for painting with silica graphite add 0.2c. per pound.

CYANIDE TRADE IN SOUTH AFRICA.—The gold mines are accustomed to make yearly contracts for cyanide with foreign manufacturers. Since the resumption of mining after the Boer war, deliveries have been mostly on orders taken in 1899, but with the increasing activity in production new contracts may soon be expected. German makers heretofore have been the largest contractors, and according to the British Board of Trade special commissioner who has investigated South African trade, the German syndicate which controls the sale of cyanide has quoted as low as 9.5d. (19c.) per lb. from Hamburg, delivered at Johannesburg. The German syndicate has always kept its price a fraction below the British, but Great Britain will be favored in future by the 2.5 per cent preferential duty which Germany must pay on shipments to South Africa.

[2]As used in France, the term 'granulite' refers to relatively fine-grained granitic rocks, often gneissic, composed of quartz and feldspar, with or without muscovite.

[3]These localities are in France.

THEORIES OF ORE DEPOSITION HISTORICALLY CONSIDERED.*

By S. F. EMMONS.

(*Continued from page 159.*)

The middle part of the 19th century was characterized by the increasing use of laboratory experiments in chemistry and physics as aids in testing the current theories of vein formation, as is shown in the preceding sketch of progress of opinions among French geologists.

A similar progress was going on in other countries, especially in Germany, which was more particularly a country of mines and mining engineers, though among students of this subject there was less solidarity of opinion than with the French, and their investigations for a long time were rather on chemical than on physical lines.

A great impulse to increased accuracy in geological investigation was given by the classic work of G. Bischof on 'Physical and Chemical Geology' (1846-7), which discusses in a masterly way the processes involved in most of the known geological phenomena, largely on the basis of the author's own researches and experiments, and which may be said to have raised chemical geology to the rank of a distinct science. In the course of his investigations, Bischof, having found that the constituents of the gangue minerals of veins are found in the country rocks, thought it probable that the metals of the sulphide ores might also exist in these rocks in the form of silicates. Later, and independently, Forchhammer, the Danish chemist, in the course of his long-continued investigations of the waters of the ocean, detected minute amounts of many of the metals of ore-deposits both in sea water and in different varieties of rocks. It was long before the suggestions offered by these discoveries had any practical effect on ore-deposit investigations.

The leading authorities on ore-deposits of that period were von Beust, Breithaupt, H. Müller, and von Cotta. The latter for over thirty years occupied the chair of geology at Freiberg, during which time he had opportunities of visiting most of the important mines of Europe. His text-book on ore-deposits (1853-59), which up to the end of the third quarter of the century was the standard authority both in Europe and America (through Prime's translation, 1869), may be assumed to be a good exponent of the knowledge of the time. It gives a fair-minded statement of all the theories that had been given to account for the formation of vein minerals, showing, however, a leaning toward the infiltration or hydrothermal theory of vein filling, based on the fact that some of the most common constituents are found in existing thermal waters, and that thermal waters containing CO_2 or H_2S are found in the deeper workings of some mines. In general, however, his views, whether on classes of deposits or individual types, do not betray the firm conviction that would result from an exhaustive and systematic study. Moreover, the fact that his classification of deposits is based on the more or less accidental character of form, without any reference to genesis, would indicate that his genetic ideas were still in a tentative state.

In 1873, Professor F. Sandberger, feeling that the current theories inadequately explained many of the phenomena of vein deposits, followed out the suggestions of Bischof in making an extended series of analyses of the country rocks of veins. By separating, previous to analysis, the constituent minerals of the rocks by means of solutions of varying densities he succeeded in demonstrating to his own satisfaction that the characteristic minerals of different deposits are contained in the basic silicates of the adjoining rocks; and in 1880 propounded his theory of lateral secretion, according to which the mineral contents of veins are derived, not from some unknown depth, but from the immediate wall rock, being brought in by percolating waters which are not necessarily at a very high temperature. As against the thermal spring theory, he argued that a very small proportion of known thermals contain any of the metallic minerals whatever and none in the state of sulphides; further, that the deposits observed in their channels have been precipitated in immediate proximity to the surface and under physical and chemical conditions that differ essentially from those that must have prevailed at the depths at which veins were formed.

Sandberger's theory, though for a time it found many adherents, was bitterly contested, especially by Stelzner, von Cotta's successor at Freiberg, and by Posepny, professor at the Mining School of Przibram, in Bohemia. They maintained that the facts in their respective districts disapproved the lateral secretion theory in the restricted sense in which Sandberger employed it, and they demonstrated by a repetition of his analyses that, owing to imperfect methods, he had not proved the metals he found to be necessarily original constituents of the rocks in which they were supposed to occur. Whatever opinion may be held as to the merits of Sandberger's theory, as such, it undoubtedly contributed to the advance of the study of ore-deposits in stimulating what may be called verification—that is, the practical testing of theory in its application to concrete instances in nature.

In general, it may be said of the period that was now closing that, though facts of observation and experiment had been accumulating, the advances in the study of ore-deposits during that time were much less than those that had been made in other branches of geological science.

The third period, covering in a general way the last quarter of the nineteenth century, may be called the period of verification. So fertile had been the imagination of previous thinkers on this subject that at this time it was practically impossible to conceive a theory of origin for a given ore-deposit that had not already been proposed, or, at least, suggested. The investigations now to be carried on with more perfect methods, or in the light of recent advances in the science, would seem more properly verifications of old theories than the propounding of new ones.

Methods and the microscope had been the two great agents of progress. The greatest improvement in method has resulted from government aid, under which it has been possible for organized bodies of scientific workers to make special examination of entire mining districts, and thus determine all the facts bearing upon ore deposition in those districts with an exhaustiveness that was impracticable for the unaided individual observer. The newly created science of microscopical petrography, through the intimate knowledge it has afforded

*Presidential address before the Geological Society of America, at St. Louis, Dec. 30, 1903.

of the internal structure of rocks and ores, has admitted so accurate a determination of the processes by which they have been formed, that much that was formerly mere conjecture has become established on basis of fact. America, which hitherto had occupied a very subordinate position, had come to the front, not only in the production of metallic ores, but in the correct understanding of the processes by which they were formed.

In order to appreciate properly the progress which has been made during this period, one must endeavor to realize the mental standpoint of the average student at the close of the preceding period.

To the miner and prospector, whose opinions carry weight because of their wide practical experience, a typical ore-deposit was a vein which, once an open crack extending to an indefinite depth, had been filled by material introduced in one way or another from below and the more nearly a deposit approached this typical form the greater its value. Indeed, for a time, some of the most valuable deposits in the West were entirely neglected by the prospector because they did not possess the physical characteristics of the "true fissure vein." This misconception arose from the fact that this, being the most clearly defined form of deposit, had been the only one mentioned in early speculations, and that hitherto the classification of text-books, based as they were on the almost accidental characteristic of form, relegated other types of deposit to a distinct and relatively subordinate class, disregarding the fact that this class includes many of the largest and most productive ore-bodies which may not only have the same origin, but often be associated in the same deposit with a typical fissure vein.

Von Groddeck, on the other hand, who represents the most advanced scientific opinions of his time (1879) divides ore deposits into two classes:

1. Those formed contemporaneously with the enclosing rock whether (a) sedimentary, or (b) eruptive, and

2. Those of later formation classed under two heads: (a) those filling pre-existing open spaces; and (b) metamorphic deposits formed by alteration of the rock in place.

His two main divisions corresponded to a certain extent with those made in 1854 by J. D. Whitney ('Metallic Wealth of the United States'), namely, stratified and unstratified. One difference is that metamorphic deposits were included by Whitney in the first division and by von Groddeck in his second. Neither recognized their true importance, and the latter, while admitting that he included in this class those that Stelzner had called metasomatic deposits, said they could not be regarded as separate deposits, because they are only incidental phenomena of the filling of cavities.

As a means of obtaining a clear view of the whole field von Groddeck divided known deposits into types (54 in number) characterized in the main by their varying mineralogical and lithological associations. Of these, sixteen belong to his first subdivision, five to the second, twenty-six to the third, and seven in part to the third and fourth, a classification which he admitted must be considered but tentative, owing to defects in existing knowledge which would be remedied only when all mines could be studied on a monographic or exhaustive system.

In America, though apparently unknown to von Groddeck, such monographic studies had already been made: That of the Comstock Lode by King ('Fortieth Parallel Reports,' 1870), of the Lake Superior Copper Deposits by Pumpelly ('Michigan Geological Survey,' 1873), and on 'The Lead Deposits of the Mississippi Valley' by Chamberlin (Wisconsin Geological Survey, 1873-79). These were followed in the early eighties by reports on the 'Comstock Lode' by Becker, on 'Leadville' by Emmons, on 'Eureka' by Curtis, and on the 'Copper-Bearing Rocks of Lake Superior' by Irving, monographic studies which constituted an important feature in the plan of work laid out for the newly established United States Geological Survey. It was the expectation of those who planned this work that, when all the important mining districts of the United States had been thus exhaustively studied, a sufficient store of well-ascertained facts regarding ore-deposits would have been accumulated to admit of the formulation of a new theory more firmly grounded on a basis of established fact than any that had yet been presented.

It may be said of the deposits studied in the first decade of the Survey work that, in the form in which they were found, they were all determined to have been deposited from aqueous solutions and to be of later origin than the enclosing rock. The lead and zinc ores of the Mississippi valley might have been included in von Groddeck's contemporaneous class, if, as assumed by Whitney and Chamberlin, these metals had been deposited with the limestones at the time of their formation, but, while as to this ultimate source there is some difference of opinion, all are agreed that the concentration which produced the workable ore-bodies was of later date, hence it seems more logical to consider them of later formation than the enclosing rocks.

In the case of the other deposits studied at that time, which were found to occur either in, or in the immediate vicinity of, eruptive rocks, it was assumed that the percolating waters had derived their metallic contents from some of these eruptive rocks, which careful tests had shown to contain small amounts of the various materials of the deposits. This derivation had an advantage over that of indefinite depth, as appealed to by the ascensionist or hydrothermal school, inasmuch as it admitted some sort of experimental proof, indirect though it was, and because at the depth at which the rocks might be supposed to be essentially richer in metals than those found at the surface, cracks sufficiently open to admit a free flow of thermal waters were considered impossible under the conditions of pressure assumed to exist there. This view was called a 'lateral secretion' theory, though it differed essentially from that of Sandberger, in that the derivation of the vein minerals was not restricted to the immediate wall-rocks (*nebengesteine*) of the deposits; indeed, in a later discusion it was characterized as another form of the ascension theory. The circulating waters which had brought in the vein materials were assumed, though not always explicitly, to be of meteoric origin—waters which, originally descending from the surface, had become heated either in contact with igneous rocks, or by the internal heat of the earth, and, gathering up mineral matter in their journey, had redeposited it, when conditions favored precipitation rather than solution. The natural channels through which these waters would circulate most freely, and which hence were most favorable to ore deposition, were rock-fractures produced by dynamic movements in the crust—the faults or joints to which Daubrée had given the designation 'lithoclases.' In no case were these fractures found to be contraction-fissures, such as Werner and many subsequent writers assumed to be the typical vein-fissure, disregarding the consideration that contraction-fissures could not traverse two distinct bodies of rock. To the joint-like fissures that are confined to a single bed, Whitney had already given the name 'gash veins.'

In the Comstock report, Becker had discussed mathematically the mechanics of faulting as applied to vein-fissures, and had shown that an important characteristic of faulting on a fissure in solid rock is the tendency of the movement to separate the rock into sheets by subordinate fissures parallel to the main one. From practical observation Emmons had similarly concluded that the faulting movement which produced vein-fissures was often distributed on a number of parallel fissures, thus producing a sheeting of the country rock. Where these fissures were sufficiently close together, so that the intermediate sheets of country rock were very thin and had been partially replaced by vein material, a banding would result which might be mistaken for that of the typical vein of incrustation. Where they were further apart and of approximately equal strength the mineral filling, instead of being confined to a single fissure, might be distributed on several, thus rendering frequent crosscutting advisable in their exploitation.

(*To be Continued.*)

MINING IN GREAT BRITAIN.

In the course of his review of mine company registration during 1903, appearing in the London *Mining Journal,* Mr. Edward Ashmead points out that only five small companies appear in the list for Cornwall, and he then proceeds to say:

"The most deplorable thing in connection with mining is the low ebb to which British metalliferous mining is reduced. From being one of the most flourishing of industries, it has dwindled down to almost the vanishing point. Great Britain never claimed to be a gold-producing country, but for tin, copper, lead and zinc it was, within the memories of many of those living, able to produce, not only all of these metals required for home use, but even to export part of its production to foreign countries. For some time now Great Britain has been gradually closing down its own mines, and helping somewhat largely to find the means to open those in other countries. According to the mineral statistics of the United Kingdom, compiled by the late Mr. Robert Hunt, we had in the year 1881 no less than 95 mines working and producing tin (all in the two western counties), 68 producing copper, 250 producing lead, and 50 producing zinc, making no less than 463 mines producing these four metals alone. The produce of these mines not only added directly to the wealth of the nation, but gave honest and constant employment to thousands of hands. Turning to my own tables, I find that in the three years 1881-3 166 companies for working metalliferous mines were registered at Somerset House, having a total capital of £7,726,566. Twenty years later, 1901-3, only 36 companies were registered, and the united capital fell to £1,044,350."

THE OUTLOOK FOR MINING IN THE NEW TERRITORY OPENED UP BY THE SAN PEDRO, LOS ANGELES & SALT LAKE RAILROAD.

By M. S. Duffield.

(*Continued from page* 156.)

By far the most numerous mines in the Spring mountain region are the lead-silver properties of the A. J. Campbell estate. The late A. J. Campbell owned about 30 patented claims, many of which have shipped considerable ore in their day. The Ruth, May Belle and May Kirby groups were the principal shippers and furnished rich ore. The "sand carbonates," a phrase that survives the palmy days of Silver Reef and Leadville, were the best ores. The Mountain Top mine, where erosion had exposed a large cavernous deposit of galena, near the summit of the lime measures, was a famous claim. The policy of the late Mr. Campbell was that of "staying with the ore;" this, no doubt, was the soundest mining in view of the character of the deposits distributed through the limestones of this district, but the general result has been a depressing one, as the properties are now left with practically no ore exposed or development work done.

Aside from these properties there are also several silver-lead and gold prospects. The gold claims are mostly along the porphyry dike that cuts through the limestone; copper is found in the lime, generally near the dolomite; galena occurs in cavities in the limestone. In the experience of the camp, 'spar veins,' or calcite stringers, in the limestone are considered indications of lead. There has been one find of cinnabar near Good Springs. It is known as the Red Cloud, and was discovered by J. C. Armstrong. It occurs in the hanging-wall of a porphyry dike, about 50 ft. wide, which fissures two slightly different limestones. The porphyry can easily be traced along the foot-hills, and presents a different ore-belt from any in the Good Spring district. The cinnabar is found associated with free gold, which is rather an unusual occurrence.

Speaking broadly, the Spring mountain district affords mineral from one end of the range to the other and promises well for the future. It is the best mineralized region along the entire route of the new railroad, which will be but a few miles east of both Cottonwood Springs and Good Springs. At present these camps are tributary to Manvel, the terminus of the Santa Fe spur from Blake. To-day the Keystone and other properties in the porphyry are the most important; the silver-lead ores will no doubt receive systematic exploitation, but the best outlook is that the completion of the new road will induce 'leasers' to prospect the lead and copper deposits. If rates are fair, the district will certainly be a great leaser's camp, and the knowledge which is sure to be thus obtained of the deposits may eventually lead to substantial results.

Due east of the Spring mountain range is a wide igneous landscape which gradually descends to the Colorado river. It is a region of dry lakes and long 'washes'; the Vegas wash leads from the southeast rim of Las Vegas valley eastward to the Colorado river; parallel with the Vegas wash—some 25 miles farther south—is the Eldorado cañon wash, in which is the famous old gold camp of Eldorado. Both these washes extend through rolling lava and ash hills, and finally break through the volcanic range that borders the Colorado river. South of Eldorado cañon is Searchlight, the mining center of Lincoln county, Nevada. These districts are at present tributary to Manvel, but it seems self-evident that all the country north of Searchlight will be eventually tributary to the new San Pedro, Los Angeles & Salt Lake Railroad. An easy wagon grade can be obtained from Eldorado cañon around the north end of the McCullough mountains;

MAY KIRBY MINE, GOOD SPRINGS, NEVADA.

the distance probably will be even less than at present from both these camps, and this choice of roads will be a great boon. Except for one spring at the north end of the McCullough mountains, the country between these two camps and the Spring mountains (an area of about 40 miles square) is a desert utterly devoid of water. It has never been prospected, and nothing is known of it. There is no grass, and consequently even cattlemen give it a wide berth. The northern portion of the McCullough mountains consists of granite for 20

SEARCHLIGHT, NEVADA.

miles, and the Upper Silurian limestone of the Spring mountains crosses the north front of the range, so that it offers a promising field to the prospector. The central axis is a high (11,500 ft.) ridge of granite and felsite, with numerous eruptives flanking the foot-hills. The cañons are well filled with snow in the winter; cedar, juniper and piñon are abundant on the upper northern slopes. But aside from these mountains the country is one of alum hills, extinct volcanic cones, blue porphyry ridges, scoriaceous ash mounds and rhyolite cliffs—as desolate as it is inaccessible. At one place near the Vegas wash an old Aztec turquoise pit was found within the last two years, but up to the present no prospectors have examined the country.

Midway north and south in the McCullough mountains (about 25 miles from the north end) is a high laccolithic cone of a light-gray porphyry, which is known as Simmons' peak, after the discoverer of the turquoise deposits on its southern slope. These were long known as old Aztec workings by travelers crossing the McCullough mountains at Eldorado cañon, but had been considered merely poor copper prospects. It remained for Mr. Simmons to demonstrate what they really are. The Aztecs used to heat the faces of the pits and then pour water over them, so as to crack the rock. Many of their stone hammers have been found, and present operations are being carried on in some of the old pits.

The turquoise occurs as stringers and kernels in white dikes that traverse the main mass of the porphyry forming the mountain. The exact nature of this dike has not yet been determined; it appears to be strong in soda and lime. Turquoise deposits of a similar character have been found about 50 miles west of Manvel, near the line of the new railroad, and are owned by the company that is operating the Simmons group. These turquoise camps are now tributary to Manvel, but the new road will be in sight of the Simmons mine; indeed, the two roads will be in sight of each other in Ivanpah valley.

In passing, it will be of interest to note the dry lake that lies between the lower end of the Spring mountains and Clark mountain on the west and the McCullough mountains on the east. The State line between Nevada and California crosses the middle of it; it is a perfectly level extinct lake-bed, 28 miles in length, of brown, sun-cracked lava soil, so firm that a horse's hoof does not dent it, and it is apparently remarkably free from alkaline minerals. This lake was no doubt once drained by an outlet to the Colorado river and has thus escaped the conditions that make for saline deposits. With Clark mountain and the McCullough mountains on either side, the latter well mantled by snow and the strata inclined toward the lake, it seems probable that flowing water might be obtained. One well has been put down on the margin of this lake (indeed, in searching for water in these dry valleys, the last place to look for water is in the lake-beds themselves), and water was obtained at a depth of 20 ft.; but the difficulty is in raising it to the surface, windmills being as yet ill-fitted to serve for irrigation. Flowing water would be a veritable bonanza, as in this climate seven crops of lucerne are cut. The new railroad will skirt the western margin of this lake.

At the upper end of Ivanpah valley the new road will bear westerly across the northern slope of Clark mountain, and then southwesterly through a region of long dry valleys, sand dunes, low igneous ranges and long 'washes.' The old abandoned camps in the Ivanpah mountain will, of course, remain tributary to Manvel, on the Santa Fe; as will also the properties in the New York district. There are some promising mines in these two districts, but their development has been slow. The Copper World installed a smelter several years ago on Ivanpah mountain, but it was not a success. Ivanpah and New York are igneous masses presenting a great variety of porphyries, rhyolites, trachytes and andesites. There are a few areas of limestone, greatly tilted and

disrupted. The ores are mostly sulphides. In Vanderbilt, a small gold camp near Manvel, there are some free-milling gold mines and several stamp-mills. This entire district should receive an impetus from the new road, for while the Santa Fe at present controls the situation, the new road will not be so far distant as to eliminate competition. The surrounding volcanic region is rich in porphyries, the feldspars of which on decomposition afford a clay which makes the roads excellent. No park in the country has better roads than those from Manvel to Searchlight and Eldorado. This factor will enter into the competition for traffic wherever the two roads come close together.

Searchlight lies 28 miles east of Manvel, in low rounded laccolithic hills of porphyry that mark the rim of the valley east of the McCullough mountains. East of Searchlight there is a rapid descent to the Colorado river. The mines at Searchlight, such as the Quartette, Duplex and Blossom, are too well known to require description. A narrow-gauge railroad formerly hauled the ore from the Quartette to a mill placed on the Colorado river, but as depth has been gained in the workings sufficient water has been encountered to permit the milling to be done at the mine.

The old camp in Eldorado cañon, which has produced $7,000,000 in gold and silver, has long been practically abandoned. Before the civil war and long before the days of old Pioche, prospectors boated up the Colorado river to the mouth of this cañon. It was a profitable camp for 'chloriders,' who worked small stringers of 'fly speck' ore (so called from the presence of fine sulphides), and shipped their product to San Francisco by boat down the Colorado river and by way of the Gulf of California, at much cheaper rates than the railroad allows to-day. The principal mines were the Wall Street, Techatticup and Quaker City. From one small surface stope the Wall Street yielded $600,000, no ore being treated that yielded less than $40 per ton. The old stopes on the Techatticup show a fissure-vein of remarkable uniformity; standing in the tunnel level at one end of the Techatticup mountain one can see daylight in the old stopes 900 ft. above and 3,000 ft. horizontally through the mountain. The walls are diorite and andesite masses (probably of Tertiary age) that are evidently laccoliths exposed by the erosion of the easily yielding pumice and scoria. Eldorado was early famous as a 'spar' camp, the vein-matter being mostly calcite. The ore is in nodules and stringers of quartz, which are sorted out; the calcite, being as a rule barren, is thrown away. The quartz was deposited before the general erosion exposed the laccoliths, and the calcite was deposited during the erosion, old fissures being re-opened. The result has been a great quantity of low-grade ore carrying $4 to $10 per ton in gold.

The Wall Street mine has long been idle because of litigation, but later developments, below the old bonanza stope, have shown the vein to be well-defined, though poor. The bonanza stope was probably enriched by surface erosion of the outcrop which once lay in the bed of the cañon, before the later deposition of the calcite.

The camp will undoubtedly become tributary to the new railroad, being only about 25 miles distant by an easy wagon road. Steamboat transportation can scarcely be depended upon, even for the short season when the water is high. There are several promising prospects with ore-bodies that may yield from $6 to $10 per ton, and upon the solution of the problem of making $8 ore pay depends the future of the old camp.

North of the new road, and beyond Clark mountain, lies the Kingston range, a core of eruptives (andesite and felsite), with limestones and later igneous rocks forming its slopes. There are several iron 'blow-outs' throughout this range; these have been prospected somewhat, with evidence of copper in depth. North of Kingston peak and along the western rim of Pahrump valley is the old Tacopa, or Resting Springs, district. The Gunsight mine, now idle, once yielded rich silver-lead ores which were worked when Daggett was the base of supplies. The profitable ores were surface carbonates and oxides. There are numerous veins and outcrops, the most profitable being those in the region of porphyry dikes along dolomite and lime contacts. The district is interesting as the scene of J. B. Osborne's attempts at introducing traction engines to cross the desert valleys from Daggett. It is said that when the engine did not bury itself in the sand it required a 16-animal team on the road to keep it in coal and water. When the new road is completed Tacopa and Resting Springs will be quite accessible, that is, within 50, instead of being over 100, miles away.

North of Resting Springs are the Ash Meadow and Stockton districts, hitherto completely isolated; they will still be distant 75 miles of bad roads from the railroad. Although enthusiastic reports of silver and lead have come from these camps, their situation on the rim of the Amargosa desert has been against them. Little is known about them, or the region beyond (the Funeral mountains and the Death valley country) until Tonopah is reached. The valleys have been well run over by borax and niter men, but the mountains are difficult country for prospectors.[1]

From Clark mountain to Daggett, on the Santa Fe, the road traverses a desert country of lower hills and more open valleys than those of Lincoln county, Nevada. In going south of Soda lake the engineers will have to battle with the shifting sand dunes of the Devil's Playground. After crossing the Santa Fe, at Barstow, the route into Los Angeles county will lie through a well-known district.

Aside from the borax and saline deposits of San Bernardino county there are a few gold, silver and turquoise properties south of the Panimint range. In a few instances deposits of iron have been recorded, but not enough is known about them to tell whether they are anything but gossan. On the whole, but little prospecting has been done in western San Bernardino county.

In recapitulation, it can scarcely be said that this new road from Salt Lake City to the Pacific coast will bring any results that will startle the mining world. There are no proved properties that, as is often said, are "only awaiting transportation" to bring them into prominence. It is a country of abandoned camps; and the experience of these old districts is that, when once deserted, they are with difficulty awakened to fresh life. It seems probable that the new and unknown districts will receive attention. Prospectors prefer to seek a virgin field and promoters are always attracted to a new camp; furthermore, the claims of an abandoned camp are generally held by men who, while unable to develop them, hold them at exorbitant figures. Nevertheless there are large bodies of low-grade ores in this region that will some day become profitable under economic treatment. The country needs prospectors. There is, to be sure, little besides the offering of large unexplored areas to attract this necessary citizen. The region is mainly desert and water is a problem. Even the artemisia (sage-brush) of the northern valleys of the Great Basin fails, and the mesas are overrun with rabbit-brush, yucca palms, Spanish bayonet and many species of the low-growing cacti. Of grass there is scarce a living for a burro. Except in a few northern cañons there is no timber, nor is there any game except an occasional mountain sheep. The desert valleys are a dreary drag for man and beast, and the broken igneous regions are inaccessible and desolate.

Still, whenever there is a little water, the lava soil is wonderfully fertile. The railroad will encourage 'leasers' and individual mining on a small scale, and among the many occurrences of the precious ores there may be some that will have a future. It is the writer's opinion that the St. George copper belt and the Spring mountain district will receive the first attention; the latter will probably be a leaser's camp. But by far the greatest outlook for mining in the country that the railroad will traverse is undoubtedly the contemplated development of the iron ores of Iron county, Utah. When these great deposits become accessible by the new road they will enjoy such obvious advantages of through traffic to the Pacific Coast and the central States that their future seems in no doubt.

[1] The writer refers to the discussion of the alkaline wealth of the Amargosa and the Death valley region by Mr. M. R. Campbell in *Bulletin* No. 200 of the United States Geological Survey, entitled 'Reconnoissance of the Borax Deposits of Death Valley and the Mohave Desert.'

A METHOD FOR THE DETERMINATION OF SULPHUR IN COAL AND COKE.—The following method for the estimation of sulphur in coal or coke, described by J. D. Pennock and D. A. Morton, has been found to give accurate results and at the same time enables a chemist to make as many as three determinations in an hour. (*Journal* American Chemical Society, December, 1903.) Introduce into a soft steel crucible of 40 c.c. capacity 16 grams sodium peroxide and 0.7 gram coal (or 11.5 grams peroxide and 0.7 gram coke) and mix thoroughly. Cover and place the crucible on its stand in a beaker of water, in such a way that the lower half only is immersed. Ignite by thrusting a hot wire through a hole in the crucible cover. After three minutes tip crucible on its side and allow contents to dissolve, then remove crucible and add hydrochloric acid. Boil solution and add ammonia until slightly in excess, and then 15 c.c. barium chromate solution consisting of 23 grams chromate in 80 c.c. concentrated hydrochloric acid and 920 c.c. water. Add sufficient water to make 200 c.c., then ammonia in excess, and boil vigorously. Filter, wash precipitate, and add 1 gram potassium iodide crystals to the filtrate. Cool filtrate to 30° C., add 5 c.c. hydrochloric acid, and titrate with decinormal sodium thiosulphate.

Breccia is an Italian word, meaning 'broken.' It applies to rocks which are composed of angular fragments.

A NOTE ON SMELTER STACKS.

By Irvin John.

The writer had to design a brick stack of considerable height, to furnish draft for a number of lead furnaces. After figuring all details according to conditions, and giving the base such dimensions as were considered proper for safe strains per square foot of surface, it was found that the opening for the dust-flue would reduce the bearing surface at the base 33 per cent; this weakened the base on that side, and in order to give it equal strength on all sides, pilasters were built on that side, running up above the top of the dust-flue, as shown by the accompanying sketch.

It will be found that a large number of smelter stacks are built excessively strong on three sides and are weak on the dust-flue side.

Some photographs were found among a number of accumulated notes showing how a stack was prepared for demolishment; tracings of these are given to show how much the conditions resemble those frequently designed for connecting a dust-flue to the ordinary smelter-stack, and, in a lighter vein, to indicate how some of the handsome shafts will behave when struck on the side opposite the dust-flue by one of the violent gales quoted by the best authorities. The photographs were taken before and during the fall of the stack.

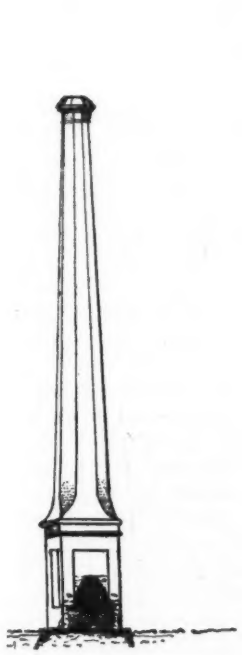


FIG. 1.

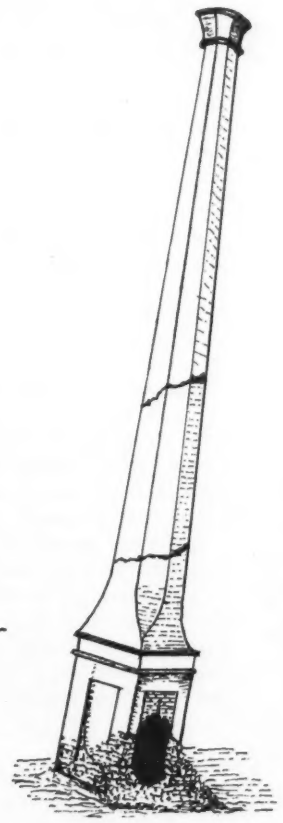


FIG. 2.

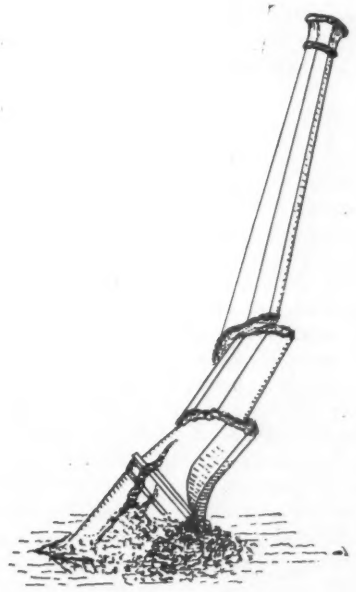


FIG. 3.

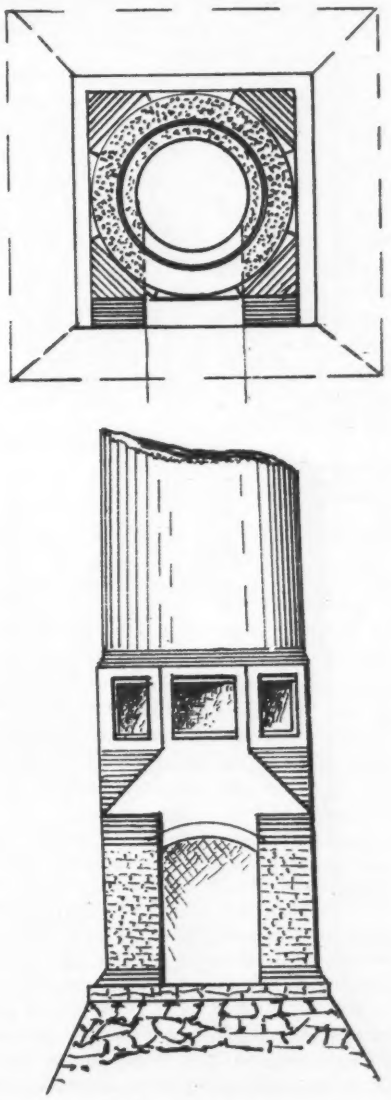
CEMENT IMPORTS.—Imports of cement into the United States in 1903 were 463,590 short tons, against 399,098 tons in 1902; an increase of 64,492 tons. Of the imports last year, 275,483 tons were from Germany; 147,515 tons from Belgium; 29,399 tons from Great Britain; and 8,456 tons from other European countries.

PHOSPHORESCENT THORIUM OXIDE—BERZELIUM.*

By Charles M. Baskerville.

In a previous paper (*American Journal of Science*, December, 1903), the author called attention to the fact that only two of the rare earth oxides, namely, zirconium and thorium dioxides, phosphoresced under the influence of ultra-violet light, produced by sparking high voltage currents between iron terminals. The author applied this method to fractions of thorium, which he had obtained in his work with complexity of that accepted element. In the preparation of the tetra-chloride to be used in atomic mass determinations he obtained a very volatile chloride, beautiful crystalline chloride close by the mixture of oxide and carbon, and a residue remained in the boat. Oxides obtained from these three fractions were subjected to the influence of ultra-violet light. The residue containing the tentative carolinium phosphoresced only very slightly. The true thorium, or middle portion, phosphoresced about ten times as intensely as the original material, while the voltatile portion did not phosphoresce at all. These preparations were made from thorium oxide which had been subjected to a large number of fractionations to render it as pure as possible. The oxide was mixed with the purest sugar carbon in a carbon boat; the chlorine, which was free from oxygen, was thoroughly scrubbed by being passed through as many as twenty towers or flasks containing concentrated pure sulphuric acid or phosphorus pent-oxide. The boat was placed within large quartz tubes, which were, in turn, inserted in large porcelain tubes and subjected to the intense heat of a combustion furnace. Part of the volatile chloride was collected in alcohol, in which it is soluble. While the extreme oxides are not freed from thorium, they still serve for atomic weight determinations. The residue in the boat gave a value of 241.46; the volatile chloride, 212.7; the original material, 233. The sulphate method was used. It is well known that that work is subject to criticism, but it serves admirably for watching fractionations. No molecular weight determinations have been made as yet. Before making the atomic weight determinations the material was freed from any silica by treatment with pure hydrofluoric acid, after it had been digested; in turn by concentrated hydrochloric and nitric acids. Ammonia free water, which had been prepared by condensation in block-tin pipe, was repurified by distillation in platinum. Berzelius first noted this volatile body (*weiser dampff*), and stated it was not thorium; hence the element is given the name berzelium.

*Abstract of paper read before Section C (chemistry), American Association for the Advancement of Science, St. Louis meeting, December, 1903.



BASE OF 275-FT. STACK.
TORREON, MEXICO.

GOLD MINING IN SIAM.—It is reported that gold-quartz veins have been found near Kelantan by an English company which has secured proprietary rights in that region. Dredging operations are also being carried on in the district.

MINE ACCIDENTS IN GREAT BRITAIN.

We are indebted to the Mine Inspector's office of the British Home Department for an advance proof from the report showing the number of fatal accidents and deaths in the mines and quarries of the United Kingdom during the year 1903. These mines are divided into three classes: Those under the Coal Mines Regulation act, which applies to mines of coal, fire-clay, stratified iron ore and shale; those under the Metalliferous Mines act, which includes all mines or underground workings not covered by the Coal Mines act; and, finally, the quarries, which are defined by the Quarries act as open workings, any part of which is more than 20 ft. deep, from which slate, stone or other minerals are taken.

The report shows that during 1903 there were 1,032 accidents occurring in coal mines, by which 1,067 persons were killed; showing an increase as compared with 1902 of 113 accidents and 43 deaths. In the metal mines 25 accidents are reported, causing the death of 25 persons, which is a decrease from 1902 of four accidents and an equal number of workmen killed. In the quarries last year 90 accidents occurred, causing the death of 95 persons, which is a decrease of 23 accidents and 25 persons killed from the previous year.

The causes of these accidents in 1903 are reported as follows:

	Coal.	Metal.	Quarries.	Total.
Explosions, gas or dust	13	..	..	13
Falls of ground	566	11	44	621
Shaft accidents	69	2	..	71
Blasting	29	1	8	38
Haulage	173	..	4	177
Miscellaneous	62	7	28	97
Total underground or inside	912	21	84	1,017
Surface or outside	155	4	11	170
Total	1,067	25	95	1,187

It will be seen that 52.3 per cent of the deaths were caused by falls of roof or ground; 14.9 per cent by haulage or mine cars; 6.0 per cent in shafts. Of the total number, 85.7 per cent were underground in mines, or inside quarries; 14.3 per cent were on surface at mines or quarries.

The total number of deaths in all classes of workings compares with that reported for 1902 as follows:

	1902.	1903.	Changes.
Coal mines	1,024	1,067	I. 43
Metal mines	29	25	D. 4
Quarries	119	95	D. 24
Total	1,172	1,187	I. 15

As the advance proof does not give the number of men employed, the ratios cannot be given until the complete report is received.

PETROLEUM IN NEW CALEDONIA.—It is reported that a company has been formed with 200,000 fr. capital to explore for oil in New Caledonia (*Bulletin du Commerce*, October 31, 1903). The operations will be limited at first to the vicinity of Koumac, where small quantities of petroleum were found several years ago in limestone strata.

IMPORTS OF PRECIOUS STONES.—Imports of precious stones into the United States in 1903 were valued as follows: Diamonds, uncut, $10,286,667; diamonds, cut, but not set, $12,952,315; other precious stones, $4,965,800; total, $28,234,782. The total in 1902 was $26,777,041; showing an increase of $1,457,741 in 1903. The imports of diamond dust and bort were valued at $254,060 last year.

PIG IRON PRODUCTION IN THE UNITED STATES.

The American Iron & Steel Association, with its usual promptness, has issued the completed statistics of pig iron in the United States for the year 1903. The current issue of the *Bulletin* of the Association says: "The American Iron & Steel Association has received from the manufacturers complete statistics of the production of all kinds of pig iron in the United States in 1903; also of the stocks of pig iron which were for sale on December 31, 1903. As in other years, we thank our friends, the manufacturers, for the trouble they have taken to send us their statistics promptly. We have received reports directly from every furnace in the country."

The total production of pig iron in 1903 was 18,009,252 gross tons, against 17,821,307 tons in 1902, 15,878,354 tons in 1901, 13,789,242 tons in 1900, 13,620,703 tons in 1899, and 11,773,934 tons in 1898. The following table gives the half-yearly production of pig iron in the last two years, in gross tons.

	1902.	1903.
First half	8,808,574	9,707,367
Second half	9,012,733	8,301,885
Total	17,821,307	18,009,252

The production of 1903 was 187,945 tons in excess of that of 1902, but the production in the second half of 1903 was 1,405,482 tons less than in the first half. This was a very great decline to occur in six months, and wholly unprecedented. It was due to a variety of well understood causes, but it is worthy of note that the reaction in the iron trade which this decline so pointedly emphasizes really began in the first half of the year, when prices began to break, although the production of pig iron was not adversely affected until after July. It was not, however, until October that production began to decline rapidly, and there was a progressive decline in November and December. Prices of pig iron began to weaken noticeably in April, and from that month until the end of the year there was a steady decline.

The better classification is that made by the purposes for which the iron is intended. Divided in this way, the production for two years was as follows:

	1902. Tons.	1902. Per ct.	1903. Tons.	1903. Per ct.
Foundry and forge	5,176,568	29.1	5,785,957	32.1
Bessemer and low phosphorous	10,393,168	58.3	9,989,908	55.5
Basic	2,038,590	11.4	2,040,726	11.3
Spiegel and ferro.	212,981	1.2	192,661	1.1
Total	17,821,307	100.0	18,009,252	100.0

The changes in quantities and proportions shown by the above table were as follows:

		Tons.		Per ct.
Foundry and forge	I.	609,389	I.	3.0
Bessemer and low phosphorus	D.	403,260	D.	2.8
Basic	I.	2,136	D.	0.1
Spiegeleisen and ferro-manganese	D.	20,320	D.	0.1
Total	I.	187,945		...

The decrease in production in bessemer pig was due to the fact that most of the furnaces, which went out of blast in the closing months of the year, had been running on that class of iron.

The classification, as made by the furnaces, is not altogether exact, and some iron classed as foundry and forge is used in making steel.

The production of pig iron, classified according to fuel used, was as follows:

	1902.	1903.	Changes.
Bituminous	16,315,891	15,592,221	D. 723,670
Anthracite	1,115,247	1,911,347	I. 796,100
Charcoal	390,169	505,684	I. 115,515
Total	17,821,307	18,009,252	I. 187,945

Nearly all the iron classed as bituminous is made with coke as fuel, very few furnaces in this country using raw coal. Nearly all the anthracite furnaces use some coke, mixed with the anthracite coal. A few charcoal furnaces also use some coke; but the quantity of iron reported as made with mixed charcoal and coke, in 1903, was only 927 tons. The increase in anthracite iron in 1903, is, of course, due to the fact that in 1902 many anthracite furnaces were forced to use coke alone for part of the year.

The production of pig iron by States for two years past was as follows:

	1902.	1903.
Massachusetts	3,360	3,265
Connecticut	12,086	14,501
New York	401,369	552,917
New Jersey	191,380	211,667
Pennsylvania	8,117,800	8,211,500
Maryland	303,229	324,570
Virginia	537,216	544,034
North Carolina and Georgia	32,315	75,602
Alabama	1,472,211	1,561,398
Texas	3,095	11,653
West Virginia	183,005	199,013
Kentucky	110,725	102,441
Tennessee	392,778	418,368
Ohio	3,631,388	3,287,434
Illinois	1,730,220	1,692,375
Michigan	155,213	244,709
Wisconsin and Minnesota	273,987	283,516
Missouri, Colorado & Washington	269,930	270,289
Total	17,821,307	18,009,252

The stocks of pig iron which were unsold in the hands of manufacturers, or which were under their control in warrant yards and elsewhere at the close of 1903 and were not intended for their own consumption, amounted to 591,438 tons, against 126,301 tons on June 30, 1903, and 49,951 tons on December 31, 1902.

The American Pig Iron Storage Warrant Company held no pig iron whatever in any of its yards on December 31, 1902, but on December 31, 1903, it held 47,200 tons, of which 40,149 tons were still controlled by the makers and 7,051 tons were in other hands.

The whole number of furnaces in blast on December 31, 1903, was 182, against 320 on June 30, 1903, 307 on December 31, 1902, and 266 on December 31, 1901. The number in blast at the end of 1903 was the smallest at the close of any calendar year since December 31, 1896, when 159 furnaces were in blast.

CONNELLSVILLE COKE.

According to the statistics collected by the Connellsville *Courier*, the coke output of the Connellsville and Lower Connellsville regions, in Pennsylvania, for 1903, aggregated 13,345,230 net tons, being nearly 800,000 tons less than that of 1902, which was 14,138,740 tons. The slump occurred in the last two months of the year, and was occasioned by the blowing out of a number of furnaces, owing to the sudden decline in the iron trade. The shipments for November and December were less than one-half the average for the other ten months. Had the average held up, the output for the year would have exceeded the record-breaker of 1902. Upon the whole, however, 1903 was a better year. While there was not as much coke sold, the operators got a better price for it, and their returns were greater than those of 1902. Valuing the United States Steel Corporation's product at the market quotations, the average price of Connellsville coke for 1903 is estimated at $3 per ton, as against $2.37 in 1902. At this rate the value of the output would be over $40,000,000, or $7,000,000 more than the value of the output of 1902. Of the output of 1903, the Connellsville region proper produced 10,870,448 tons and the Lower Connellsville region 2,474,782 tons.

LAKE SUPERIOR IRON ORE SHIPMENTS.

By DWIGHT E. WOODBRIDGE.

In the ENGINEERING AND MINING JOURNAL for January 14 there was published a statement of the total shipments of Lake Superior iron ores by water for the year 1903, with an estimate of the all-rail shipments of that year, together with the tonnage moved from the various ranges. It is now possible to give figures of the production of individual mines and of the various companies interested in the business of mining ore in the Lake country, which will be interesting and instructive. It will be noted that, except in the case of those companies that had a small output in 1902, and were then new producers, most of the companies—whether steel-making concerns or sellers on the open market—reduced their business last year, and the percentage of this reduction has been fairly uniform.

The leading producers of the year were as follows, compared with the season of 1902:

	1902.	1903.	Changes.
U. S. Steel Corporation	16,025,000	14,355,000	D. 2,570,000
Corrigan, McKinney & Co.	2,190,000	1,565,000	D. 635,000
Cleveland Cliffs Iron Co.	1,720,000	1,315,000	D. 405,000
Pickands, Mather & Co.	1,270,000	1,100,000	D. 170,000
Republic Iron & Steel Co.	336,000	493,000	I. 157,000
Penn. Iron Mining Co.	792,000	1,000,000	I. 208,000
Jos. Sellwood et al.	383,000	831,000	I. 448,000
Jones & Laughlins	442,000	631,000	I. 189,000
International Harvester Co.	.....	216,000	I. 216,000
Oglebay, Norton & Co.	129,000	240,000	I. 111,000
Ferdinand Schlesinger	309,000	320,000	I. 11,000

There was, of course, a large amount of ore produced by others, but the aggregate was made up by small quantities from each.

In the above table some explanation are necessary. The shipments of the United States Steel Corporation, as given, do not include any part of either Mahoning or Union, though the Corporation owns interests in each. On the other hand, they do include all of the Lake Superior, on the Marquette range and of the Regent, though a 25-per-cent interest in each is held by the Cleveland Cliffs Iron Company. The figures for Pickands, Mather & Co. do not include half of Cypress, which is owned jointly by them and Joseph Sellwood. Republic Iron & Steel is credited with all of Union, of which it owns but half, and of Clifford, but not with any part of Mahoning, in which it holds a minority interest.

There were 15 mines on Lake Superior that shipped last year in excess of 500,000 tons each. This is one less than the number which reached that limit the previous year. These mines, their products for the two years and their owners, are as follows:

	Owner.	1902.	1903.	Changes.
Marquette Range.				
Cleveland Cliffs Iron Co.	Same	1,104,864	839,527	D. 265,337
Lake Superior Iron Co.	U. S. S.	832,796	604,829	D. 227,967
Menominee Range:				
Chapin mine	U. S. S.	956,812	704,114	D. 252,698
Aragon mine	U. S. S.	646,203	522,035	D. 124,168
Gogebic Range.				
Norrie mine	U. S. S.	1,080,032	790,269	D. 289,763
Vermillion Range.				
Pioneer mine	U. S. S.	673,863	596,780	D. 77,083
Mesabi Range.				
Fayal mine	U. S. S.	1,919,172	1,460,815	D. 358,357
Mountain Iron mine	U. S. S.	1,421,456	1,342,697	D. 78,759
Adams mine	U. S. S.	1,242,923	1,109,798	D. 133,125
Stevenson mine	Corrigan	1,434,681	1,014,582	D. 420,099
Biwabik mine	Tod	623,127	807,581	I. 184,454
Burt mine	U. S. S.	.....	631,147	I. 631,147
Lake Superior group	U. S. S.	766,311	593,962	D. 172,349
Spruce mine	U. S. S.	543,203	585,815	I. 42,612
Mahoning Ore. & Steel Co.	Same	1,038,645	1,010,338	D. 28,307

The Burt mine, Mesabi range, is a new property, that in 1902 was a small underground portion of the Lake Superior group. Its development has practically all been since 1902. It is an open-pit mine. operated by steam shovel, and its tremendous shipment the first year is an example of what can be done in that method of work. The mine did not commence shipments until June, and it would have produced 1,000,000 tons instead of 630,000 if the market had remained as it was early in the year.

The big shippers of the Mesabi range are mostly open-pit mines, though Fayal and Adams are chiefly underground, and Lake Superior and Spruce entirely so. All the old-range shippers take their ore from underground. The production of the largest of this latter class for each of the five Lake Superior districts has been as follows, since their beginning: Menominee range, Chapin mine, 11,960,527 tons; Marquette range, Cleveland-Cliffs, 12,308,643; Lake Superior, 11,722,719; Gogebic range, Norrie-Pabst, 13,860,000; Vermilion range, Chandler, 8,134,164; Soudan, 7,628,625; Mesabi range, Lake Superior 2,914,481. With the single exception of Cleveland-Cliffs, these are all mines of the United States Steel Corporation.

A certain misunderstanding exists as to the Baraboo district in central Wisconsin. Not a single car-load of ore was shipped from there during the year; the Illinois mine closed on the day the first train was to have loaded. The range did not, therefore, come in as a producer in 1903.

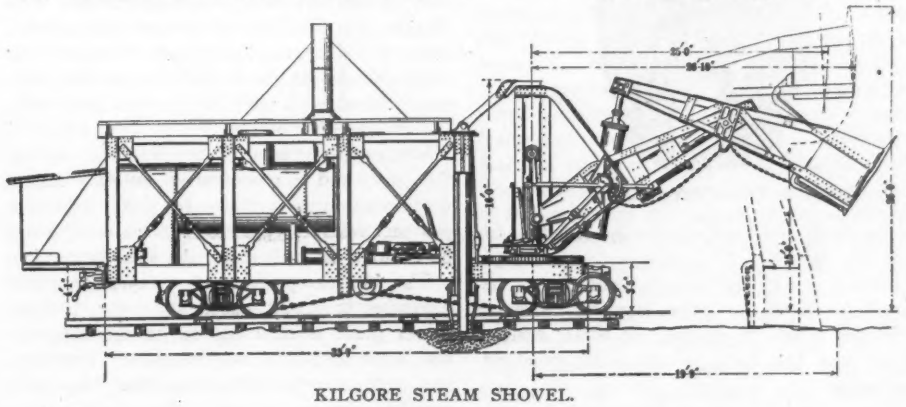
BLAST-FURNACES IN GREAT BRITAIN.—According to a report issued by the British Iron Trade Association, there were 316 blast-furnaces in operation in Great Britain on December 31 last. Of these, 216 were in England, 21 in Wales and 79 in Scotland. The number in blast was 38 less than that reported at the opening of the year. The number of idle furnaces on December 31 was 227; but it is probable that in England, as in this country, a number of old furnaces continue to be carried on the list which will probably never be operated again.

A NEW TYPE OF STEAM SHOVEL.

A novel type of direct-acting steam shovel has recently been designed and introduced by the Kilgore Machine Company, of Minneapolis, Minn. The accompanying illustration is from a blue-print of a shovel of this type having a capacity of 2.5 cu. yd. in the dipper.

The machine is so designed that all the movements of the dipper are controlled by four direct-acting steam cylinders, having light balanced valves operated by two easy-moving hand-levers. The engineer's platform swinging with the dipper, he has an unobstructed view of the dipper at all times, and can dump the load when and where desired by means of a steam cylinder worked by a foot lever.

These machines are built almost entirely of steel, and are rigid and powerful. Direct steam pressure is used, all cylinders are cushioned at each end of the stroke, and can be worked full stroke at high speed without injury. The forces for both crowding and hoisting are in direction of resistance to the cutting edge of the dipper. The maximum amount of steam possible to use for one motion of the dipper is only that necessary to fill each cylinder once. Steam is used expansively, the point of cut-off being controlled by the engineer's levers. One man does the work ordinarily done by engineer and cranesman, as the engineer both fills and dumps the dipper by steam. All motions of the dipper can be reversed with equal power. If the front trucks get off the rail, the dipper can be lowered to the ground, and, by using lifting and swinging cylinders, the front end of the car can be raised and swung on to the track. The dipper can be moved forward or back by means of the forcing cylinder, thus giving a chance to withdraw the dipper from the bank when full and dump without going clear through to the top of the bank. This movement is also used in spotting the car when dumping. By using both oscillating and forcing cylinders, a straight horizontal thrust along the ground is obtained. The dipper can be shaken violently to toss off the sod or any large boulders too big to pass through the dipper opening, or to free sticky clay. By working two pistons at once the dipper can be moved in a direct line to the point desired. It can nose around a root or rock, reach beyond it to pull it back, pick it up, move in a direct line to the dumping point, and toss it over the top of the dipper if necessary. The shovel is self-propelling.

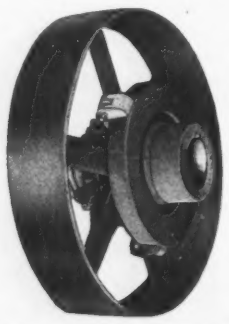


KILGORE STEAM SHOVEL.

Crustification is the deposition of a crystalline lining upon the walls of cavities in concentric succession. It is a characteristic feature of cavity-filling.

A NEW FRICTION CLUTCH.

The accompanying illustration shows a friction clutch, known as the Muir improved steel-plate clutch, which has been especially designed for use at high speeds. Another point considered in this device is the possibility of avoiding stoppages of machinery whenever it is necessary to tighten up or adjust the clutch, or to renew worn surfaces. It is claimed by the makers that this device will run efficiently at a high speed, and can be adjusted without stopping any part of the machinery, except the special tool or apparatus run by the pulley attached to the clutch. The arrangement and construction can be easily understood by referring to the cut. The wearing surfaces are large, and are made of friction paper fastened to a steel disk by means of maple dowels. The working strain on the friction surface, it is estimated, is only 3.75 lb. per square inch to transmit the full rated power of the clutch. This comparatively light pressure insures long life. The friction surface can be renewed easily and quickly at a slight cost. The clutch occupies small space



MUIR FRICTION CLUTCH.

on the shaft, and runs noiselessly, either in or out of motion. An additional advantage claimed is that small-sized clutches can be placed on shafts of large diameter, without additional cost. A number of these devices are in use, and have so far given excellent satisfaction.

These clutches are manufactured by the Skillin & Richards Manufacturing Company, of Chicago. They are made either split or solid, and fitted with brass bushings, or babbitted sleeves, as may be desired. They are made in all sizes from 15 to 72 in. in diameter.

ABSTRACTS OF OFFICIAL REPORTS.

New York & Honduras Rosario Mining Company.

This company owns a valuable mining property in Honduras, which it has operated successfully for several years. The capital stock of the company is $1,500,000. The statement of profit and loss account for the year ending November 30, which is covered by the report, is as follows:

Bullion receipts	$436,818
Miscellaneous	1,985
Total	$438,803
Supplies and general expenses	$109,986
Expenses in Honduras	334,609
Total expenses	$444,595
Add dividends paid	15,000
Total payments	$459,595
Balance, passed to surplus account	$20,792

The manager reports that during the year the mill crushed 15,620 dry tons of ore, producing 163 bars of bullion, containing 790 oz. of gold and 266,352 oz. silver; also 414 tons of concentrates, containing 2,863 oz. gold and 417,454 oz. silver; the total thus produced being 3,653 oz. gold and 683,806 oz. silver. In September 10 stamps were added to the mill, having double-discharge motors, together with tanks and pans necesary to increase its capacity. The mill is also to be improved by putting double-discharge motors with the old stamps, and also by using heavier stamp-heads. The sorting plant has also been increased. A number of new buildings were added at the mine and other improvements made.

In the mine a great quantity of dead work and repair work was done during the year. The condition of the timbering, ore chutes, tracks and drainage demanded much attention. The bulk of the mine work is now being done on points from 5,000 to 6,000 ft. from the mouths of the main adits. The water which has found its way from the upper workings, lessening the ground below, is now being gradually caught up and brought to the surface in ditches and canals at the various levels. In all, 19,300 ft. of ditches have been opened and 1,420 ft. of plank canals have been made to carry the water past old stopes and connections. Timbering in this mine is an important and expensive work; moreover, the heaviest timbers do not last very long. The transportation of ore has been much improved. The Rosario adit has been relaid with heavier rails, the old rails being too light to stand the weight of the electric locomotive and the heavy cars. In addition, 3,850 ft. of track have been laid in the other levels.

Much prospecting work has been done during the year, and a conservative estimate makes the total tonnage of ore in sight, including prospect reserve, 53,320 tons. This reserve can be counted on with reasonable certainty.

The electric power and compressor plant continues to render excellent service, but the power plant is now run to its full capacity, and some additions are necessary. The electric railroad service has been much improved and its capacity increased. The tramway has given good service throughout the year, but it was necessary to renew several of the wooden towers.

The director's report calls attention to the disturbed political situation in Honduras, which embraces the company's works to some extent. A number of the laborers were drafted away or deserted, while the trouble at the port of Amapala delayed shipments, and also the receipts of supplies.

The president's report says, in conclusion: "Our chief endeavor in the past year has been to discover and develop new ore-bodies, as those formerly existing had been, in a large measure, worked out. In this we consider that we have been largely successful, as will be seen by the report of our general manager, showing reserves of 53,320 tons of good grade ore, of which 31,820 is blocked out and 21,500 practically in sight, with reasonable indications of other large deposits. To accomplish this, 9,199 ft. of tunnels, raises and cross-cuts have been driven, 30,000 ft. of steel rails furnished and laid, and 20,720 ft. of ditches and canals built in the levels to care for the water. When we consider that, at the present time, our main workings are 5,000 to 6,000 ft. from our outlets, it will be seen how necessary these large outlays have been in order to provide safe and economic transport to the surface, and at the same time to supply sufficient ventilation to enable the work to be carried on. . . .

"From all this, we come to the conclusion that the prospects are more favorable than they have ever been in the history of the mine, for which we are mainly indebted to the able and efficient work of Mr. J. H. Weddle, our general manager, and his competent staff, to all of whom we render our thanks."

Monongahela River Consolidated Coal & Coke Company.

This company is the consolidation owning the river mines in the Pittsburg district; that is, those mines which ship their output by the Monongahela and Ohio rivers. The report is for the year ending October 31, 1903.

The balance-sheet at the close of the year was as follows:

Resources:	1902.	1903.
Cash on hand and in banks	$313,892	$314,522
Accounts and bills receivable	2,957,168	3,616,104
Coal on hand	1,822,971	2,080,944
Supplies on hand	813,475	712,940
Office furniture	12,862	14,284
Stocks of other corporations	422,050	422,050
Investments	38,685,611	38,705,215
Total	$45,028,029	$45,866,059
Liabilities:		
Preferred stock	$9,995,000	$9,995,000
Common stock	20,000,000	19,995,000
Bonds	9,468,000	9,350,000
Certificates of indebtedness	2,060,000	2,060,000
Current debt	2,467,931	2,507,391
Undivided profits	1,037,098	1,958,668
Total	$45,028,029	$45,866,059

The liquid assets—cash, coal and accounts—at the close of the year amounted to $6,724,510; the current debt was $2,507,391, leaving a balance of $4,217,119. During the year $118,000 bonds were retired through the sinking fund.

The statement of earnings is as follows, the profits given being the net earnings, after deducting all expenses, bad debts and other losses:

Profits for the year	$3,713,370
Maintenance and repairs of river craft	$606,347
Depreciation charged off	329,111
Interest paid	649,163
Royalty on coal mined	507,528
Total charges	$2,092,149
Net balance	$1,621,221
Dividends on preferred stock	699,650
Surplus for the year	$921,571
Brought forward from 1902	1,037,098
Undivided profits, Oct. 31, 1903	$1,958,669

Of the royalty on coal mined, the sum of $266,204 was reinvested in coal lands, the balance of $241,324 being used to retire bonds.

The coal mined during the year was 193,221,674 bushels, or 7,728,867 short tons; showing an increase of 1,122,950 tons over the previous year.

Since the organization of the company 3,225 acres of its coal lands have been mined out and 65 acres sold, while 3,301 acres have been purchased. This shows a net increase of 11 acres in the coal lands owned.

BRITISH PATENTS.—The number of applications for patents received at the British Patent office in 1903 was 28,818, a decrease of 140 from the number received in the previous year.

COAL IN BORNEO.—The discovery of an extensive coal-bed is reported at Serudong, in British North Borneo. The outcrops show coal of very good quality. The principal difficulty in working this coal would probably be in obtaining labor.

BOOKS RECEIVED.

In sending books for notices, will publishers, for their own sake and for that of book buyers, give the retail price? These notices do not supersede review in a subsequent issue of the ENGINEERING AND MINING JOURNAL.

United States Geological Survey. Production of Glass Sand in 1902. By A. T. Coons. Washington; Government Printing Office. Pages, 14.

Tables for Chemical Calculations, with Explanations and Examples. By Horace L. Wells. New York; Henry Holt & Company. Pages, 60. Price, $1.

A Review of Industrial Conditions in British Columbia in 1903. Prepared by the Bureau of Provincial Information. Victoria, B. C.; Public Printer. Pages, 44.

Geological Survey of Western Australia. Bulletin No. 8. *Murchison Gold-field.* By Charles G. Gibson. Perth, W. A.; Government Printer. Pages, 34; with map.

Annual Report of the Mine Inspector for Allegany and Garrett Counties, Maryland, 1902-1903. James P. Carroll, Mine Inspector. Midland, Md.; published for the State. Pages, 44.

State of Ohio. Twenty-eighth Annual Report of the Chief Inspector of Mines, for the year 1902. Elmer G. Biddison, Chief Mine Inspector. Columbus, Ohio; State Printer. Pages, 240.

Transactions of the American Society of Mechanical Engineers. Volume XXIV, 1903. F. R. Hutton, Secretary. New York; published by the Society. Pages, 1,564; illustrated.

Annual Report of the Comptroller of the Currency of the United States. 1903. *Volume* I. William B. Ridgely, Comptroller. Washington; Government Printing Office. Pages, 1,072.

The Colliery Manager's Pocket-book, Almanac and Diary for 1904. *Thirty-fifth year.* Edited by R. A. S. Redmayne. London, England. The *Colliery Guardian* Company. Pages, 276; illustrated.

Fortschritte der Praktischen Geologie. First Part, 1893 *to* 1902. Compiled by Max Krahmann. Berlin, Germany; Julius Springer. Pages, 410; with maps and tables. Price (in New York), $6.25.

Geological Survey of Western Australia. Bulletin No. 9. *Geological Features and Mineral Resources of Northampton.* By A. Gibb Maitland. Perth, W. A.; Government Printer. Pages, 28; with map.

Geological Survey of Western Australia. Bulletin No. 10. *Paleontological Contributions to the Geology of the State.* By R. Etheridge, Jr. Perth, W. A.; Government Printer. Pages, 44; with map.

Report of the Acting Minister of Finance to H. M., the Emperor, on the Budget of the Russian Empire for 1904. St. Petersburg, Russia; Printing Office of the Imperial Academy of Science. Pages, 42.

Mineral Resources of the State of Rio Grande do Sul, Brazil. By H. Kilburn Scott. Newcastle-upon-Tyne, England; reprinted from the *Transactions* of the Institution of Mining Engineers. Pages, 20; illustrated.

Society for the Promotion of Engineering Education. Proceedings. Volume XI, 1903. Edited by Calvin M. Woodward, Frank Allen and Clarence A. Waldo. New York; *Engineering News* Publishing Company. Pages, 380. Price, to members, $1.50; to libraries, $2; to others, $2.50.

BOOKS REVIEWED.

Annuaire pour l'An, 1904. Compiled by the Bureau of Longitudes of France. Paris; Gauthier-Villars. Pages, 732; with appendix.

This annual, corresponding in a general way with our 'Nautical Almanac,' enjoys a well-deserved reputation for accuracy and trustworthiness. Beginning with the present issue new features are to be added to the volumes each year with a view of increasing their value as works of reference. The novel features of this volume are detailed tables of physical and chemical constants.

On the Location and Examination of Magnetic Ore-Deposits by Magneto-metric Measurements. By Eugene Haanel, Dominion Superintendent of Mines. Ottawa, Canada; published by the Department of the Interior. Pages, 132; with eight plates, besides illustrations in text.

At the meeting of the Canadian Mining Institute in Montreal last March, Dr. Haanel gave an interesting lecture on the use of magnetic instruments in locating deposits of magnetic iron ores. This has been extensively practiced and carefully studied in Sweden, though the method has, curiosly enough, received little attention in other iron mining countries. It is true that attention was called to the possibilities presented by the use of the magnet, as long ago as 1843, by Freiherr von Wrede, in Germany; but he did nothing toward carrying his ideas into practice. The real foundation for this work was laid by Professor Robert Thalen, who published his book on the 'Examination of Iron Ore Deposits by Magnetic Measurements' in 1879. Since then, new methods have been devised and many improvements made, until the magnetic method has reached a high degree of development in Sweden. Notwithstanding this, nothing concerning it has been published in English or German, with the exception of a few short papers, which are accessible only with difficulty. Dr. Haanel has done good service in presenting this study of the methods pursued, and the results obtained, by Swedish engineers.

Chapter 1 of the book treats in a general way of magnets and their properties; chapters 2 and 3 of the Magnetic Field; chapters 4 and 5 of the Disturbed Terrestrial Field of Force. Chapters 6 and 7 describe the Thalen-Tiborg magnetometer and its applications. Two following chapters are devoted to Dahlblom's modification of the same method. Chapter 10 is on the Vertical Intensity of the Disturbed Field. This is followed by chapters on the Thomson-Thalen magnetometer and the Swedish mining compass. The remaining chapters are devoted to the investigation of magnetic ore-deposits, showing the methods of obtaining and applying magneto-metric measurements. An appendix describes the Dahlblom magnetometer. A number of tables are added, which are intended to facilitate the calculation of results from observations. The book is fully illustrated by the engravings in the text, and by the large plates appended.

The author has carefully worked out his subject, and has illustrated the more abstruse portion fully by diagrams and mathematical calculations. His book will be appreciated by students and engineers, and will supply those who wish to carry the magnetic method into practice with much useful information. Unlike some works of similar character, it gives little space to historical matter, seeking rather to describe the latest developments and the most approved practice in the field. Sufficient space, however, is given to the fundamental principles upon which magnetic methods are based, an understanding of which is necessary to a clear conception of the subject and an intelligent use of the system.

Iron, Steel and Other Alloys. By Henry Marion Howe. Boston, 1903; Sauveur & Whiting. Pages, 457; with diagrams. Price, $5.

The author, whose eminence among metallurgists is recognized by all the world, states that the heterogeneousness of the book is due to its being undertaken originally for the use of his students and later amplified to meet the needs of practitioners by giving them a systematic account of the metallography of iron to-day, and more particularly to expose to them the present or solution theory of that metallography. The book thus covers the nature of alloys; cooling and freezing-point curves; constitution of binary alloys forming no chemical compound; the metallography of iron and steel, and the phase rule and its application. The discussion of these and related topics, the part of the work that will appeal chiefly to students and investigators, covers nearly 250 pages. Of chief interest and value to men employed in iron and steel works are the chapters on 'The Heat Treatment of Steel and Cast Iron'; on 'Progress in the Manufacture of Iron and Steel Between 1880 and 1900'; 'The Blast Furnace,' and 'Metallurgical Gas Furnaces.' These chapters take about 200 pages and give an excellent résumé of subjects mentioned. The clear exposition of metallurgical reactions and the brief but comprehensive summarizing of principles of construction call for particular commendation. The diagrams showing the processes that occur in furnaces and other devices are notably good, and a welcome contrast to those found in too many metallurgical treatises.

In that portion of the book which takes up the solution theory of alloys and its application to iron and steel, prominence is given to the results obtained in the field of higher metallurgical research, by the study of the structure of metals and alloys with the microscope. Professor Howe compares the constitution of alloys with the arrangement of the component minerals in crystalline rocks; that is, he compares metallography with petrography, pointing out that the chief method used in metallography is to correlate the results of the examination (1) of the structure as revealed by the microscope, (2) of the physical properties of individual alloys, and (3) of the physical properties of series of alloys, taken as a whole.

It is not possible in the compass of this review to follow Professor Howe in his discussion of eutectics and æolics (or eutectoids) of freezing-point and saturation curves and the

various phases of iron and steel, though he frequently refers to matters which have a direct connection with everyday operations at iron and steel works. He classifies the important varieties of iron and steel as follows: "They may be divided (1) according to the presence or absence of slag into (A) the slag-bearing or weld metal and (B) the slagless or ingot series; (2) according to their carbon content into (A) low-carbon steel and wrought iron, (B) higher carbon steel, and (C) cast iron; according to whether their properties are due chiefly to their carbon or to some other element, into (A) the normal or carbon, and (B) the alloy steels and cast iron; and (4) according to the method of manufacture into (A) bessemer, (B) open-hearth, etc." This classification, it will be seen, makes the presence of slag, not eliminated in the process of manufacture, the essential feature that differentiates wrought iron from low-carbon steels.

The author summarizes the chief constituents of the iron-carbon compounds, the steels and cast irons, thus: "(1) In the slowly cooled state *pearlite*, a conglomerate of (2) the soft, weak ductile *ferrite* and (3) the hard, brittle *cementite*, in the ratio of 6 : 1, together with whatever excess of ferrite or cementite is present over and above this ratio; (4) also in the slowly-cooled state of cast-iron *graphite*, a non-metallic and, as it were, a foreign body; (5) in the suddenly-cooled state of both steel and cast-iron, *austenite*. We may classify all our steel and cast irons according to this grouping." He divides iron into three series: (1) the pearlite, (2) the graphito-pearlite, (3) the austenite.

The book should find many readers. It is a notable addition to the literature of iron and steel and shows strikingly how great has been the advance in the field of metallurgical research since the author wrote his 'Metallurgy of Steel' in 1890. The book is well printed and has a serviceable index, but its value would not have been lessened by a more attractive binding.

CORRESPONDENCE.

We invite correspondence upon matters of interest to the industries of mining and metallurgy. Communications should invariably be accompanied with the name and address of the writer. Initials only will be published when so requested.

Letters should be addressed to the EDITOR.

We do not hold ourselves responsible for the opinions expressed by correspondents.

Corinth Feldspar Mine.

Sir.—At Corinth, Saratoga county, N. Y., situated on the hillside a short distance from the depot, is a feldspar mine of excellent quality.

In the folding and flexing of the earth's crust in the lower Adirondack region a vein was formed extending northeast and southwest. This vein was first brought to my attention when on an observation tour with my class in geology Its outcropping was traced by them for nearly a mile. At an easily accessible point, on lands owned by Walter J. Pitkin, the vein has been opened and found to contain feldspar. At this point the vein is nearly 70 ft. wide, and has been excavated so as to show a face of 40 ft. in depth. Judging from the width and outline of the vein, it must extend to a great depth. The quality of the feldspar is the clearest I have ever seen. There is a little garnet disseminated through the vein; yet in so small a quantity that it can be separated easily. The quality of the product is excellent and the quantity seems inexhaustible. Specimens have been submitted to geologists and mining experts, who have been unanimous in pronouncing the feldspar of excellent quality for pottery and glazing.

A. M. HOLLISTER.

Corinth, N. Y., Dec. 27, 1903.

Cobalt and Nickel in Kentucky.

Sir.—The counties of Crittenden and Livingstone, with possible portions of Caldwell and Lyon counties, Kentucky, comprise what is commonly termed the western Kentucky mining district.

For many years prior to 1902, the mining and shipping of fluorspar was an important industry. During that year the discovery of extremely high-grade carbonate of zinc in bodies of much more than normal size led to more extensive prospecting, resulting in the uncovering of profitable veins of both blende and galena. There are at the present time some twenty-five mining companies actively at work, and the production and shipments of both lead and zinc ores increase every month. The fluorspar production has also increased in a wonderful ratio, several hundred people being engaged in the mining and shipping of it.

Some months ago it was noticed that an ore of manganese was prevalent in the fluorspar shafts of the Given's Mining Company; the streaks ranged in thickness from 4 to 12 in., and in one shaft half a dozen of them ran side by side the entire depth of the shaft, which had been sunk about 100 ft. On this ground several other openings on the same class of ore have been made. Samples of the material were sent to W. George Waring, at Webb City, Mo., who made very complete determinations, as follows: Assay results, for the Given's Mining Company, on black cobaltiferous wad or manganese (bog manganese).

	Per cent.
Binoxide of manganese	36.91
Oxide of cobalt	11.54
Oxide of nickel	5.52
Sesquioxide of iron	4.75
Alumina	2.43
Silica	25.79
Lime	0.89
Combined water	12.17
	100.00
Loss on ignition	16.70

Professor Waring, who became much interested in this material, says: "Heretofore, such ore has only been found in one mine, the Mine La Motte, in Missouri, and the whole of the mineral has been shipped to a chemical firm in England. This firm makes it into the pure oxides of cobalt, nickel and manganese. Cobalt oxide is worth about $2.30 per lb; nickel oxide is worth $0.60; manganese (pure) is worth $0.05 per pound."

One ton of the ore, similar to the sample, contains, at present market prices, 230 lb. oxide of cobalt, worth $529; 110 lb. oxide of nickel, worth $66.24; 738 lb. oxide of manganese, worth $36.90; total, $632.14. It is stated that the cost of manufacturing these oxides on the ground here in the wet way would not exceed $100 per ton, and very likely would be less than $40.

The cost of mining this ore, as at present conducted, will reach a possible $15, which will naturally decrease as greater experience is gained in the handling of it.

The ore resembles cannel coal, having the same shiny texture, although in form it is more like kidneys of galena, ranging from the size of hazel nuts to several pounds in weight. It is invariably found associated with clay, and in the several instances mentioned it is continuous so far as prospected, being in that respect different from the like ore in New Caledonia, as reported in the ENGINEERING AND MINING JOURNAL.

This district, with its exceedingly strong vertical veins of lead and zinc ores and fluorspar, is but little known outside of the State, yet it bids fair to become a very large producer. Should our iron pyrite carry nickel and cobalt, as now anticipated, a large influx of capital will naturally result.

D. C. ROBERTS.

Marion, Ky., Jan. 14, 1904.

A Texas Oil Discovery.

Sir.—Regarding the oil lately discovered by me in this section of Texas, and the indications which led to the discovery, I have to say that these oils are found to come to the surface over an area of about 359 square miles. This area has been pretty carefully prospected for surface springs, and 25 points of flow have been located. Samples have been gathered and bottled. The oil comes through the water in a series of disks from the size of a pinhead to a dollar. Quantity, from a few ounces to a quart; color, water-white, through delicate shades of yellow to port-wine and nearly black; odor varies from a naphtha-like smell to a sweetish; one spring yielded an aromatic oil; gravity appears to be about like the kerosene of commerce. From the same spring different colored oils appear at different times. No two springs are exactly alike. The oils, as taken from the ground, burn freely in an ordinary lamp without smoke, and with no treatment whatever, save standing in bottles, so closely resemble the products of a refinery as to give rise to the question of their natural origin. Our State geologist says he has never seen such oils; he is now satisfied as to their natural origin. The oil is always accompanied with gas, frequently bringing up asphalt, sulphur and greasy matters, which quickly settle, leaving the oil bright and clear. The uprising of the oil lasts but a few seconds.

At the first discovery, samples were sent to Dr. Boverton Redwood, of London, for analysis. I have not the record; my agent in London retained that; but he informs me that Dr. Redwood said he found the oil a high-grade illuminating oil, with scarcely a trace of sulphur. There are few such, and the manner of their coming up go far to prove the existence of a valuable deposit.

The appearance of these "natural distillates" seems very rare, if not entirely unknown. It appears to me that the naphtha springs of Persia and the Baku district of the Caspian Sea present something of an analogy, and I should be obliged if you will kindly direct me to a work giving a description of the oil springs of that district. The oil first came to notice about two years ago in the bed of a creek, and could be smelt, like naphtha, for several hundred yards. Since then we have found many springs.

JAMES SPICER.

Kerrville, Kerr county, Texas, Jan. 14, 1904.

QUESTIONS AND ANSWERS.

Queries should relate to matters within our special province, such as mining, metallurgy, chemistry, geology, etc.; preference will be given to topics which seem to be of interest to others besides the inquirer. We cannot give professional advice, which should be obtained from a consulting expert, nor can we give advice about mining companies or mining stock. Brief replies to questions will be welcomed from correspondents. While names will not be published, all inquirers must send their names and addresses. Preference will, of course, always be given to questions submitted by subscribers.

Cleaning Copper Plates.—May I ask for an explanation of the following? In the 'sweating' process for cleaning gold off copper plates it is customary to drive off the mercury by a moderate heat and then, after allowing the plate to cool, to add muriatic acid. After this a mixture of sal-ammoniac and salpeter is to be added and a stronger heat applied. For what reason is the muriatic acid added and what is the chemical effect of the sal-ammoniac and saltpeter?—R. H.

Answer.—The effect of the sal-ammoniac is to dissolve off any film of copper oxide that may have formed on the surface of the copper; this is done in order to promote metallic contact between the mercury and the copper. Dilute acid is used to dissolve the verdigris, or thin film of hydrated copper oxide; this film, which is prejudicial to amalgamation, is due to the oxidation of part of the copper of the copper amalgam.

Transportation of Gas by Pipe-lines.—On page 541, issue of THE ENGINEERING AND MINING JOURNAL of October 10, I notice an article entitled 'Pipe-line Construction,' from which I quote as follows: "Thus the transportation of 4,000,000 cu. ft. of gas per 24 hours (166,667 ft. per hour) a distance of 20 miles with intake pressure of 200 lb. and discharge of 20 lb. requires a 6-in. pipe."

I am very much interested in the matter of transportation of gas through pipe-lines under high pressure, and have made quite a study of what information I have been able to secure on this subject; from all of which I have worked up a formula which seems to me to be the best and most complete of anything that I have found, although there seems to be a great poverty of information on this subject. Working the problem in the above quotation by this formula, and on the assumption that the natural gas referred to has a specific gravity of 0.50, the results should widely differ from those stated by you, and I therefore beg to inquire if the information given is the result of observation from actual practice, or whether it is worked from a formula. If so, I will be pleased to learn the formula used.—L.

Answer.—The capacity of the pipe-line under the conditions specified was computed by the formula

$$Q = 41 \sqrt{\frac{d^5 (P^2 - p^2)}{l}}$$

in which Q is the quantity of gas in cubic feet per hour, d the diameter of the pipe in inches, P and p the absolute pressure of the gas in pounds at the inlet and outlet, respectively, and l the length of the pipe in miles. The factor 41 is a constant. It is sometimes taken as 42 and sometimes as 40. It should really be a trifle more than 41, being based on the figure 3,000 when l is stated in feet; extracting the square root of 5,280 and dividing 3,000 by the quotient gives 41.1 ×. This formula is used by some engineers to arrive at the volume of gas of 0.65 specific gravity. According to it, a 1-in. pipe, 20 miles long, with pressure of 200—20 lb. (above atmospheric) would deliver about 1,959.4 cu. ft. per hour. A 6-in. line would deliver 95 times as much, or 186,143 cu. ft. This is more than would be worked out directly by the formula for a 6-in. line, the result of which would be 171,495 cu. ft. This is because the multipliers determined by experiment show that the capacity of a pipe increases actually in a little greater ratio than the square root of the fifth power of the diameter.

Another formula that is employed is

$$Q = 40\, d^2 \sqrt{\frac{d\ (P - \rho)}{D l}}$$

in which D is the specific gravity of the gas; save for that, and the use of the factor 40 instead of 41, it is the same as the first formula, but the introduction of the factor of specific gravity, which is a decimal, in the denominator under the square root sign gives a larger quotient and consequently higher results.

Both these formulas give very much higher results than those which are commonly given for the flow of coal gas in pipes, which, according to various authorities, are as follows:

King

$$Q = 1350 \sqrt{\frac{d^5\ h}{s\ l}}$$

Molesworth

$$Q = 1000 \sqrt{\frac{d^5\ h}{s\ l}}$$

Gill

$$Q = 1291 \sqrt{\frac{d^5\ h}{s\ (l + d)}}$$

In these d is the diameter of the pipe in inches, h the pressure in inches of water, s the specific gravity of the pipe, and l the length of the pipe in yards.

Gill's formula is said to be based on experimental data, and to make allowance for obstructions by tar, water and other bodies tending to check the flow of gas. An experiment made in London with a 4-in. pipe, 6 miles long, with gas of 0.398 specific gravity and 3-in. pressure, gave a result which corresponded closely with Molesworth's formula (see Kent's 'Mechanical Engineer's Pocket-book,' p. 657).

The figure 0.50 is rather low for the specific gravity of natural gas, which is commonly assumed at 0.60 to 0.65. The specific gravity of methane is 0.533, while that of ethane is 1,034. According to S. A. Ford, the specific gravity of the gas found in the vicinity of Pittsburg, Pa., was about 0.65, as a rule.

RECENT DECISIONS AFFECTING THE MINING INDUSTRY.

SPECIALLY REPORTED.

SUIT TO QUIET TITLE IS CONTINUATION OF LAND-OFFICE PROCEEDINGS.—A suit brought under the laws of the United States (Revised Statutes, 1901, p. 1431) in support of an adverse claim to mining ground filed in the Land office is a statutory proceeding in aid of the land department and a continuation of the proceedings instituted in the land office. It may in form be a suit in equity or an action at law, but whatever its form, the pleadings are to be construed with reference to its purpose, which is to determine the right of the applicant to a patent to the land in dispute, rather than by the strict rules of pleading, and it is not necessary to set out the probative facts in support of the complainant's title.—Tonopah Fraction Mining Company v. Douglass (123 *Federal Reporter*, 936), Circuit Court of United States.

ORES—WASTAGE ALLOWANCE IN REFINING AND SMELTING.—Section 29, tariff act of July 24, 1897, relating to the importation of certain crude ores and metals to be refined or smelted in bonded warehouses, contains the proviso "that each day a quantity of refined metal equal to 90 per centum of the amount of imported metal smelted or refined that day shall be set aside, . . . and the exportation of the 90 per centum of metals . . . shall entitle the ores and metals imported under" said section to admission without payment of duty. *Held*, in regard to importations of lead bullion containing lead and antimony, that this means 90 per cent of the pure metal contained in the crude metal as imported, as determined by assay at the time of importation, and not of the pure metal recovered by smelting and refining. . . .

"The only question presented by the record in this case is one of construction, and as, upon that question, the court is unable to concur in the conclusion which was reached by the learned judge below, the order of the circuit court must be reversed, and the cause will be remanded to that court, with direction to enter a judgment affirming the decision of the Board of General Appraisers, by which the protests of the Guggenheim Smelting Company were overruled and the decision of the collector in each case was affirmed."—Appeal of Guggenheim Smelting Company from Collector of Customs at Perth Amboy; United States Circuit Court of Appeals.

PATENTS RELATING TO MINING AND METALLURGY.

UNITED STATES.

The following is a list of patents relating to mining and metallurgy and kindred subjects, issued by the United States Patent Office. A copy of the specifications of any of these will be mailed by the ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. In ordering specifications correspondents are requested to name the issue of the JOURNAL in which notice of the patent appeared.

Week Ending January 26, 1904.

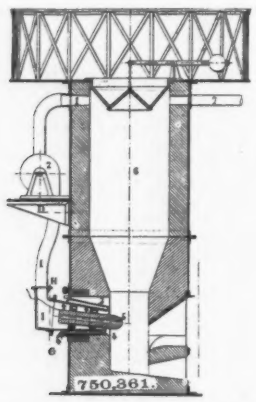
750,253. METHOD OF DRAWING ARTICLES FROM MOLTEN BATHS.—Clarence P. Byrnes, Swickley, Pa. The method of forming homogeneous metal articles, consisting in lowering the lower end of a bait into a metallic bath, and gradually raising the same to form an article depending from the lower end of said bait.

750,281. ORE CONCENTRATOR.—Thomas H. Hicks, Fort Wayne, Ind., assignor to the Hicks Gold and Silver Extraction Company. In an ore concentrator, a spirally-descending concentrating trough; a series of riffles 16 arranged diagonally upon the bottom of said trough and converging toward the inner wall thereof; and means to differentially oscillate the trough.

750,323. COKE OVEN DOOR.—Birdine Troutman, Saxton, Pa. The combination with the doors, of a lug formed upon the lower door, and the upper door frame having a recess within which the lug is adapted to be received and lock the lower door, said pin also acting as a fulcrum for the coal leveling implement.

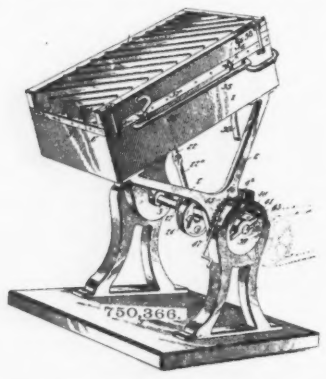
750,361. ELECTROMETALLURGY OF IRON OR STEEL.—Henri Harmet, St. Etienne, France. A process of continuously and sequentially reducing and fusing iron ores by electrometallurgy, which consists in first charging the ore and an excess of reducing carbon into the upper portion of an electric furnace; second, heating the base of the furnace from electrodes to form a fusion zone or crucible in the furnace; third, conveying gas taken from above the charge into the fusion zone adjacent to the electrodes, fourth, forcing said gas under pres-

sure through the fusion zone to thereby diffuse the heat of the zone, extend its area and convert the



gas into carbon monoxide, and finally forcing the carbon monoxide thus formed through the charge to create a reducing zone in the charge above the fusion zone of the furnace.

750,366. PNEUMATIC DRY ORE-SEPARATOR.—Edwin M. Jahraus, Dayton, Ohio. The combination, with suitable supports and a horizontal axis, of an



ore separator box having pendent arms which are journaled on such axis, an eccentric on such axis, a jointed piston rod connected with the said eccentric, an air piston arranged in the box and reciprocated through the medium of the piston rod, a toothed arc formed on the side of one of the pendent arms, a hand worm-shaft journaled on one of the fixed supports, its worm engaging the toothed arc.

750,367. ORE CONCENTRATOR.—Edwin M. Jahraus, Dayton, Ohio. In a concentrator, a main supporting frame having segmental tracks thereon, the bearing surface of which are arcs of circles concentric with the main driving shaft, a main driving shaft, an inner supporting frame adjustable on said tracks, an ore-bed and air-box carried by said inner frame, and operating mechanism between said air-box and shaft, and adjustable along with the air-box.

750,382. LOADING DEVICE.—Arthur E. Merkel, Cleveland, Ohio, assignor to the Clyde Iron Works, Duluth, Minn. In a loading device, the combination of a frame means embodied in the structure of the loading device for rendering it movable upon a track adapted to be removed therefrom so as to permit the passage of cars beneath said frame and upon said track, and means for raising and lowering the frame whereby the first named means may be placed in operative relation with the frame and track and be caused to engage the latter.

750,491. FISHING-TOOL FOR OIL OR LIKE WELLS.—Chas. A. Sargent, Sheridanville, Pa. In a fishing-tool, a head or socket having tapering projections extending down therefrom with beveled inner edges.

750,511. PROCESS OF UNITING TWO METALS.—William H. Wherry, Cleveland, Ohio. A process of uniting two metals, consisting of applying to one of such metals a flux that will combine chemically with both the metals, adding to the other metal in a molten condition approximately 0.2 per cent of phosphorus, and then pouring such molten metal and phosphorus upon the other treated metal.

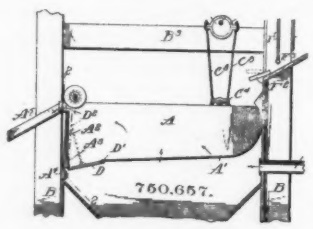
750,512. FLUX.—William H. Wherry, Cleveland, Ohio.—An improved flux for uniting metals, containing phosphorus.

750,528; 750,529 and 750,530. ROLL-GRINDING APPARATUS.—George R. Ford and Benjamin F. Allen, St. Louis, Mo.; said Allen assignor to said Ford. The combination of a roll-support, a bed-plate movable longitudinally with respect to said roll-support, and a reciprocating grinding-wheel carriage mounted on said bed-plate for movement longitudinally of said roll-support.

750,541. MANUFACTURE OF WHITE LEAD.—John W. H. James, Philadelphia, Pa. An improvement in that process of making white lead which consists in subjecting oxide of lead to the action of acetic acid and carbonic-acid gas, heating said oxide of lead to about 200° F. before the acetic and carbonic-acid gas is caused to act upon the same.

750,600. BRICK-KILN FURNACE.—Eli M. Clark, Sycamore, Kan. A brick-kiln including a wall having recesses in the outer portion thereof extending upwardly from the floor of the kiln and having uniform area from the front to the rear thereof, there being openings at the rear of the recesses in the inner portion of the wall, and a narrow baffle-wall in each of said recesses extending upwardly from the floor-line of the kiln independent of said wall, in combination with a gas-burner having the outlet-surface thereof opposite to the front of said baffle-wall.

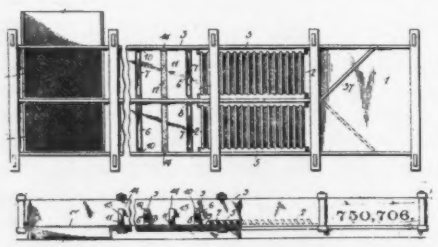
750,657. COAL-SEPARATOR.—George A. Kenner, Herrin, Ill. A coal-separator comprising a tank having an upward water-feed, a receptacle disposed within said tank in a substantially horizontal plane,



a pivotal support at the delivery end thereof, means at the opposite end for oscillating the feed of said receptacle upon said pivoted end entirely above its normal horizontal plane for feeding material toward and over the delivery end, and an automatically-operated downwardly-opening discharge-gate in the bottom of the receptacle at the pivoted delivery end thereof and connected to the receptacle by tension devices attached substantially at the pivoted axis of the receptacle.

750,701. GRINDING-MILL.—Aaron J. Robinson, Fremont, N. H. A grinding-mill comprising a divided main shaft, grinding-disks thereon rotating in opposition to each other, a supporting-base, a casing inclosing the grinding-disks and embodying a removable semi-cylindrical hood, longitudinally-divided separable lower sections one of which is stationary and the other pivotally connected to the base so as to swing horizontally, and a bearing-yoke for one of the shaft-sections rigidly connected with the pivoted section of the casing and adapted to swing therewith.

750,706. COMBINED CONCENTRATOR AND AMALGAMATOR.—Hiram J. Russell, Crescent Mills, Cal. In a concentrator, the combination of the flume, riffles arranged transversely on the floor of the flume, revolving catchers rotatively supported in the flume and adapted to be rotated by the flow in the flume, screens placed at the lower end of the flume and arranged to receive the discharge from the flume, a chute situated beneath the said screens, a feed-box supported near the said



chute, and means whereby the flow is conducted from the chute to the said feed-box, pivoted tables arranged to receive the flow from the feed-box, the said tables having surfaces covered with woolly fabric, and a concentrates-tank beneath the tables.

750,748. MELTING-FURNACE.—John F. Barker, Springfield, Mass., assignor to the Gilbert & Barker Manufacturing Company, Springfield, Mass. The combination in a melting-furnace, of two separate chambers to receive charges of material, said chambers being independently revoluble on a common axis, and there being a passage from one chamber to the other; together with means to introduce gaseous or liquid fuel into either one of said chambers.

750,753. ELECTRIC FURNACE.—Ramon C. Contardo, Sèvres, France. An electric-arc furnace, comprising a hearth having an inclined surface, electrodes above the same, an arch above the hearth consisting of two symmetrically and downwardly inclined surfaces, and side walls paralleled to said arch forming inclined flues.

GREAT BRITAIN.

The following is a list of patents published by the British Patent Office on subjects connected with mining and metallurgy:

Week Ending January 9, 1904.

27,632 of 1902. SAFETY DEVICE FOR HOISTING ENGINES.—F. Coulson, Durham. Improved apparatus for shutting off steam automatically on hoisting engine to prevent overwinding.

260 of 1903. ROASTING FURNACE.—F. Benker, Paris, France, and E. Hartman, Wiesbaden, Germany. A cylindrical rotating roasting cylinder, constructed in such a way that no apparatus of any kind is inside the cylinder.

423 of 1903. TREATING WASTE ACID.—H. W. Hemingway, London. Neutralizing acid waste pickling liquors with iron carbonate ores which dissolve much more rapidly than the scrap iron usually used.

784 of 1903. MAKING VANADIUM ALLOYS.—H. L. Herrenschmidt, Genest, France. Making vanadium alloys by first producing vanadate of soda from ores and then precipitating the vanadium by a soluble salt of the metal with which the vanadium is to be alloyed.

6,327 of 1903. LIXIVIATING COPPER ORES.—G. D. Van Arsdale, Newark, N. J., U. S. A. Lixiviating roasted copper ores with sulphuric acid, impregnating the solution with sulphurous acid obtained by roasting the ores, then heating so as to precipitate the copper, and forming free sulphuric acid which can be used over again.

9,412 of 1903. UTILIZING WASTE LIME.—H. Oliver and W. Bevan, New Ferry, Cheshire. Utilizing waste carbonate of lime from alkali works by mixing it with ground shells and a salt of magnesium and compressing it into blocks suitable for artificial stone.

15,924 and 15,925 of 1903. CONCENTRATOR.—The Wilfley Ore Concentrator Company, London. Improvements in the Wilfley concentrator, so as to enable the slimes to be caught and economically treated.

Week Ending January 16, 1904.

27,495 of 1902. COAL CUTTER.—L. W. de Grave, Derby. In coal-cutting machines an attachment so that the cutter arm may be revolved and clamped in any position round the pinion shaft.

28,387 and 28,388 of 1902. PULVERIZER.—J. Thame and the Oliver Mill Company, London. Improvements in the inventor's pulverizer in which pivoted hammers rotate at a great speed.

28,938 of 1902. PURIFYING IRON.—W. S. Simpson, London. Purifying molten iron from carbon and oxide by subjecting the vessel to violent up-and-down concussions, so as to make the lighter constituents of the iron come to the top.

12,083 of 1903. ELECTROLYTIC CELL.—E. A. Ashcroft, Weston Point. In electrolytic cells for the electrolysis of fused salts, the employment of an electro-magnet for causing rotation of the electrolyte.

15,961 of 1903. CHECKING MINE FIRES.—S. Wysocki, Inzowki, Russia. For checking fires in mines, an arrangement of doors or flaps at various points, easily closed from a central station above.

21,894 of 1903. MINE-CAR COUPLING.—C. Galloway, Cardiff. An improved self-locking pin for shackles and other couplings of colliery trams.

23,843 of 1903. LEACHING SULPHIDE ORES.—J. B. de Alzugaray, London. Leaching sulphides by means of solutions of chlorides of alkali and other metals, with free hydrochloric acid.

SPECIAL CORRESPONDENCE.

Denver. Jan. 30.

(*From Our Special Correspondent.*)

It is reported that before long, depending on conditions, the qualified martial law, which has been in force at Cripple Creek and Telluride, will end and the civil authorities will again have control.

Before the coroner's jury that investigated the accident at Stratton's Independence on January 26, Mr. Lyman E. White, commissioner of the State Bureau of Mines, and his deputy testified that the machinery of the mine was in perfect condition, so far as could be ascertained, and that all the safety appliances required by law were provided and were all in good working order. No reason was shown for the hoist getting beyond control of the engineer. Declaring that the coroner's jury "had been selected on account of its attitude in existing labor troubles in the district" and that the inquest was "conducted in a manner that precluded the possibility of arriving at the true facts," Commissioner White, on behalf of the State, called a Board of Inquiry, to make an independent investigation.

Commissioner of Mines White has denied that he made the statement published in several papers and quoted above. But the evidence introduced tends to show that he did. The acting district attorney says that information charging criminal libel and defamation of character of the jurors will be filed against Mr. White. The jury's verdict found that the accident was caused by the engineer losing control of the engine, and, further, that if the mine management had not neglected usual precautions the casualty might have been reduced if not avoided. White's inquiry board recommended certain safety appliances, but did not deal with responsibility for the accident.

The long pending Hull City placer case was tried by a jury before the United States District Court in Denver, Judge John A. Marshall, of Salt Lake, presiding. W. S. Montgomery, of Cripple Creek, was on trial on 17 counts, ten for perjury and seven for subornation of perjury in the obtaining of the placer patent. The case is preliminary to an effort to have the Government set aside the patent issued to the predecessors of the Independence Consolidated Mining Co., of which latter Mr. Eben Smith is president and Mr. W. P. Dunham is general manager. The evidence disclosed grave irregularities in the obtaining of the patent.

Judge Marshall, on January 30, instructed the jury in the Hull City placer case to return a verdict of not guilty, and Montgomery was discharged. The indictment was faulty.

Mr. Richard Pearce, identified with metallurgy in Colorado since 1867, more particularly in connection with the Boston & Colorado smelter, who has been for many years British vice-consul in Denver, has been invited to become a candidate for the British Parliament from Cornwall. Mr. Pearce cabled a declination, and received reply by cable that his refusal was not accepted.

In southern Colorado the Colorado Fuel & Iron Co. and others operators in certain districts where the coal mines have been reopened, are working full forces, gradually resuming operations at other mines and steadily increasing the output. The steel plant at Pueblo of the Colorado Fuel & Iron Co. is being started up, a department at a time, as fast as the supply of coal and coke permits, the company having during the coal shortage given the general public the preference over the requirements of the plant. The merchant iron, wire and nail mills are already running.

San Francisco. Jan. 27.

(*From Our Special Correspondent.*)

The weather continues generally dry, clear and warm. Already some of the ditch companies are worrying over the coming summer water supply and talking of raising prices. Ditches which ought to be flowing full are not filled to half their capacity, and there is little or no snow in the mountains yet, and each week of dry weather makes the prospect dubious for both gravel and quartz miners. February and March practically end the wet season in California, and the mining community is beginning to get anxious for an end of fine weather.

Official notice has been received at the land office in Redding, that some 8,000 acres of land included in the proposed forest reserve in Northern California, withdrawn from entry last year, have again been thrown open. The land lies in the mining regions of Harrison gulch, Copper City, Bully hill and Bella Vista. The people of Northern California who have been vigorously protesting against the proposed forest reserves had hoped a larger amount would be restored.

The recent decision of the Secretary of the Interior as to mining claims on lands withdrawn for reservoir sites or permanent works under the irrigation law will affect California materially. In his opinion no right is vested in the locator of a mineral claim until final proof has been submitted and purchase money paid, so unless patents have been obtained, the location would be subject to the operations of withdrawals of land. This decision is intended to protect the Government from speculators who take up land, and hold it at exorbitant price, thus delaying Government work. The ordinary prospector or miner cares little or nothing for patenting his claim, being satisfied to hold it by possessory title until he develops it enough to prove it valuable, and then he usually sells.

Duran, the man who brought suit against the Karma Gold Mining Co., of Kern county, for $70,000 damages, has been non-suited. The judge dismissed the case, documents having been submitted showing that Duran had regularly transferred his stock for a consideration.

The case of A. W. Davis against the Julian Consolidated Gold Mining Co., of Julian, San Diego county, for $10,000 damages, in which Davis alleged that while he had an option on the mine and had found a purchaser, the company refused to recognize the option, and would not accept the $75,000 offered is ended. The court decided for the defendants.

There are rumors at Grass Valley that the Empire mine of that place is about to be sold in England. The mine is a heavy producer, and is without doubt the best equipped one on this coast, Mr. W. B. Bourn, president of the company, now in Europe, has spared no expense, so that it is the "show mine" of California, besides being the oldest quartz mine in the State. The shaft is 3,000 ft. deep, and shows no diminution in the character or size of the vein.

The purchase of the Loutzenheiser ranch by the North Star Mining Co., of Grass Valley, gives it two known veins which have only been slightly worked, owing to the great flow of water. It is supposed that the main idea of the purchase is for a cyanide plant. The tailings from the present mill are worked by a small plant below the works. With the construction of the new mill at the Central shaft, the amount of tailings will be greatly increased. The tailings will be carried to the plant in flumes, and the plant is expected to be about the largest in the State.

The managers of the Gladstone mine at French gulch, Shasta county, have had no difficulty in getting all the men wanted, and have started work. The Western Federation of Miners had poor luck with the Mountain Copper and Bully Hill strikes a year ago, and northwestern California may be getting to be a non-union section. The provocation for the strikes was trifling; the owners were paying union wages and treating the men fairly. The mines of Shasta county are expected this year to make the best yield on record. Strikes have been settled, and there are plenty of men. The Mountain Copper Co. is treating the largest tonnage in its history, and the smelting plant of the Bully Hill Co. has been doubled. The Afterthought smelter will be ready in May; and the Balaklala, Trinity Copper and Mammoth are expected to become producers. Several hundred gold quartz properties are being worked to supply ores for flux. They get paid according to assay value. There are about 2,500 men now employed directly and indirectly in the mines.

An artesian well has been struck north of Rabbit springs, in the heart of the San Bernardino desert. The water flows from the 12-in. pipe, and is free from alkali. It is a great thing for the miners there.

Toronto. Jan. 27.

(*From Our Special Correspondent.*)

The International Nickel Co. is shipping about 130 tons of ore per day from the mine near Massey station to the Mond smelter at Victoria mines, Algoma, recently leased by the company. The mine has secured railway connection with the Canadian Pacific.

The Big Master gold mine in the Lake Manitou gold area of Rainy river district has closed down on account of financial difficulties.

The act passed by the Canadian parliament last session providing for the payment of bounties on lead contained in ores mined in Canada has been put into operation. Producers must notify the government of their intention to claim under the act, giving the name and location of the mine and details as to the company, etc. The smelting of all ores on which a claim is to be made shall be under the supervision of an officer of the department of trade and commerce, who may demand a floor sample of any ore delivered for smelting. The books of the company are to be open for inspection, and cost of supervision must be borne by claimants. All claims are to be substantiated by the oath of the manager and certified by a department officer.

In view of the visit of the British Iron and Steel Institute to the United States in October next, the Canadian Government is being urged to extend an official invitation to visit Canada. It is suggested that the party might come via St. John or Halifax and visit Sydney, Cape Breton, thence going to points in Quebec and Ontario and from Toronto to Pittsburg.

Regulations have been adopted by the Canadian Government regarding the payment of bounties on iron rods, plates and structural shapes manufactured from steel produced in Canada. The manufacture is to be under supervision of an officer appointed by the Minister of Customs, the books of the company are to be subject to inspection, the claim must be made within four months after the delivery of the goods for use or consumption in Canada, and notice must be given before commencing to manufacture with details as to name of company, etc.

The affairs of the Atlin Mining Co., of Ontario, Limited; the Britannia Gold Mining Co. of Ontario, Limited, and the North American Ore Co. are being wound up by the Corporation Trust Co., of Montreal, acting as trustee.

The Ontario Bureau of Mines has received reports indicating a revival of attempts at gold mining. A good find of ore at the bottom of the shaft of the old Sultana mine in the Lake of the Woods district, is announced. Two new stamp mills will be erected in the Eagle lake gold area, in the Wabigoon district. Thomas Mackie, of Pembroke, is said to have bought the Crystal gold mine, on Lake Wahnapitae, which has not been worked for some years.

The property of the North America Graphite Co., consisting of 220 acres, at Buckingham, Ontario, and a mining plant has been sold by the sheriff. It was purchased by J. I. McCracken, Ottawa, for $3,875.

Victoria. Jan. 26.

(*From Our Special Correspondent.*)

Boundary District.—Sixty tons of concentrates from the Elmore mill at the Le Roi No. 2 have been received at the Granby smelter. On the Roderick Dhu in Long Lake camp, a vein giving assay values of $125 is reported. It is believed that the Waterloo Co., Camp McKinney, will not pay a dividend in February, but will set aside profits for the purchase of the adjoining Fontenoy claim.

Cassiar.—The new Alsek diggings boomed, and on one claim on Boulder creek the gravel is said to go from 20 to 25c. to the pan at a depth of 6 ft. Block houses have been built at intervals over the entire distance from White Horse, and provisions are being taken in. Last week 150 tons of ore from the Copper King mine at White Horse were received at the Ladysmith smelter.

The Coast.—The development of the new anthracite discovery at Comox is actively proceeding. A railroad track is built to the mine, and it is expected that by March 1 the daily production will be between 300 and 400 tons. An effort is being made to sell the Lenora mine, Mt.

Sicker and other Vancouver Island mining and smelting property in England. Some very rich ore is reported shipped to the Crofton smelter from a 9-ft. vein recently developed in the Lenora.

Northwest Kootenay District.—The Prince Mining & Development Co., that is developing claims near Revelstoke, contemplates installing an electric plant in the spring. There is an excellent water power near-by. Two new companies, the Imperial Mines, Ltd., and the Keystone Mines, Ltd., have been incorporated to develop claims at Albert canyon and Keystone mountain. At a meeting of the shareholders of the Ophir-Lode Mining Syndicate, Ltd., the sale of the Oyster-Criterion group at Camborne and the Ophir-Lode group on Gainer creek to the Great Northern Mines, Ltd., was confirmed. It is announced that the Beatrice Co. will sell 48% of its stock, to provide working capital. On the Goldfinch a contract has been let for tunnelling.

Rossland District.—The last monthly report of the Le Roi states that shipments aggregated 17,250 tons, containing 5,428 oz. gold, 6,665 oz. silver, and 407,800 lbs. of copper, resulting in an estimated loss of $15,500, allowing costs of mining, smelting and marketing, and also $1.48 per ton for depreciation and development. In future the costs of development will be separately shown. A 20-drill compressor plant has arrived in Rossland for the White Bear, and 12 car loads of machinery for the Rossland Power Co.'s concentrator.

Slocan District.—Shipments of zinc concentrates are becoming larger. The Payne sold 500 tons last week to the Lanyon Co., and is arranging to ship 1,000 tons to Antwerp. The Lanyon Co. has also purchased 300 tons of zinc ore from the Ivanhoe. Reduction works utilizing a new process are to be erected soon at the Arlington, near Slocan City. At the Arlington and other properties in the vicinity are large reserves of ore which cannot be profitably treated under existing conditions.

San Luis Potosi. Jan. 26.

(*From Our Special Correspondent.*)

Engineers have been surveying between Barroteran and Santa Rosa in Coahuila for a line to be run, it is said, by the International railroad, and later extended to the Muzquiz mining district. The road would open the coal-fields of the Monterey Iron Steel Co. at Meuores, thus enabling the company to get good coal cheaply. The president of the steel company, Vicente Ferrera, is treating with the Mexican Government to have a prohibitory tariff placed on certain classes of steel imports, giving the Monterey plant a practical monopoly on steel rails, as well as structural steel. The Mexican laws do not permit monopolies, but the same result is obtained as is being done for the new dynamite factory, near Torreon, in which it is said a number of high officials are interested. The present duty on dynamite is only $30, Mexican, per metric ton. The consumption last year was some 3,500 tons of giant and 1,000 tons of black powder. As soon as the Torreon factory is in shape the duty may be raised to $210 a ton, and gives the factory control of the market, though the government retains the power to regulate prices.

The white lead works at Gomez Palacio, near Torreon, are to be enlarged. The Torreon Metallurgical Co. is to consider increasing its capitalization now $2,500,000; $100 par. The stock is quoted at $240 and paid 20% last year. The increased capital is to enlarge the plant, and purchase mines.

In Chihuahua, W. V. Petit, of Parral, is said to have sold the Adela for £220,000 to an English company that pays one-fourth down. The Refugio mine, at Parral, is reported sold to English people for $3,000,000, Mexican, through the Banco Minero. The Pinos Altos mines are reported sold to Dunham, Smith & Reid, of Denver and Los Angeles, at figures not given. At the Barranca del Cobre mines a sulphuric acid leaching plant of 50 tons daily capacity is to be erected.

Exchange on New York during the week has been dull, advancing from 221¼ to 225.

Mining stocks continue to suffer though there is some dealing. Victoria brought $120; Aldebaran, 90; Dos Estrellas, $2,050; Old Abe, $8; Noche Buena, $22; La Union, $90; Augustias, $40; La Paz, Matehuela, $170; San Rafael, $680, and Santa Gertrudis, $83. Those that have fallen below $1, including many former favorites of El Oro district, have been ruled off the board.

London. Jan. 23.

(*From Our Special Correspondent.*)

In a recent stock market report from your New York correspondent, the amalgamation scheme of the Snowshoe Gold & Copper Mines, Ltd., with the British Columbia Copper Co. was discussed, but the results of the amalgamation were incorrectly calculated, owing to the fact that your correspondent took the par value of the latter company's shares at £5, instead of $5. This made a considerable difference in the terms, as regards the British Columbia Copper Co. In London, the proposed amalgamation is considered the best policy under the circumstances. The Snowshoe Co. owns a big property, but as the grade is low there is no profit in shipping to smelters. The only possible policy is to have a smelter of its own, but as the raising of further capital for this purpose is out of the question in these dull times, the amalgamation with a company that already has smelters is the only alternative. The meeting of the Snowshoe Co. will be held this month, and the proposals for amalgamation will be placed before shareholders. There can hardly be any doubt that the proposal will be accepted, because Mr. Waterlow, the largest shareholder, is fully acquainted with all details and agrees to it. His influence with other holders naturally carries great weight.

An English company, operating in Mexico, that does not come prominently before the public, is the Cherokee Mexican Proprietary, Ltd. It was formed about two years ago, to acquire a number of properties in Durango and Chihuahua. Before an expensive plant was erected, extensive trial runs were made with a light 40-stamp mill, and the nature and extent of the ore ascertained. A stamp-mill to treat 100 tons a day is now nearing completion, and a cyanide plant is being designed. As the ore ready for sloping is very considerable in quantity (though its exact measurement is not stated), it is contemplated to add a further 60 stamps, so as to bring the daily output to 400 tons. The ore is low grade, the average extraction being about $8 per ton. When the present mill is in full working order I hope to be able to send full details.

Perth. Dec. 21.

(*From Our Special Correspondent.*)

Kalgoorlie.—The Great Boulder has cross-cut the main lode at the 1,750-ft. level, finding it 30 ft. wide and of high grade. The Kalgurli is opening up splendidly at all points. At the 640-ft. level the stope is over 200 ft. long and 40 ft. wide. The Ivanhoe Junction has struck a very rich vein at the 150-ft. level, 12 in. wide, that averages 29 oz. per ton. The Associated is adding a 20-head mill to treat the lower-grade ores, and improvements in progress in reduction works generally will greatly reduce costs. The Lake View Consols' main shaft is down 1,600 feet.

Mulgabbie District.—The recent telluride discoveries are looking well. Many mining men report favorably on the prospects. One party has a lode 4 ft. wide and is sacking ore valued at 20 to 50 oz. per ton.

Murchison Fields.—The Great Fingall yield for November was 10,854 oz. from 8,181 tons treated. Several mines are opening up well. The Rubicon is about to start crushing. The Emperor is also starting its battery.

North West Fields.—The government geologist has finished his survey of the Pilbarra districts, in order to advise on the best route for the proposed railway. The extension of the Kalgoorlie railway to Laverton is open and working satisfactorily. The Lancefield mine at Laverton, which has been worked successfully three years by a small syndicate, has been sold for £50,000.

TO ENGINEERS VISITING NEW YORK.

A room for the exclusive use of visiting mining engineers is maintained at the New York office of the ENGINEERING AND MINING JOURNAL. Visitors to the metropolis are cordially invited to take advantage of the facilities it offers, by having their mail addressed in care of the JOURNAL and making this office their headquarters. The managers of the branch offices will also be glad to welcome visiting engineers and to be of any service to them that they can.

TO ENGINEERS VISITING LONDON.

We are informed that the Institution of Mining and Metallurgy offers to all members of the American Institute of Mining Engineers nonresident in Great Britain, the privilege of free use of the Institution offices and library in Salisbury House, London Wall, E. C. Visiting engineers may have their letters addressed to the offices of the Institution, and thus enjoy the advantages of temporary office accommodation in the city of London

PERSONAL.

Mining and metallurgical engineers are invited to keep the Engineering and Mining Journal informed of their movements and appointments.

Mr. Thomas H. Leggett is now at San Francisco.

Mr. Sam McClaffin, of Oaxaca, Mex., is visiting Salt Lake City.

Mr. W. E. Defty is in Sonora, Mexico, examining several mines.

Mr. S. F. Emmons came to New York from Washington on February 1.

Mr. E. Nelson Fell is in Paris. He expects to return to Siberia shortly.

Mr. H. W. Turner has returned to San Francisco from Bohemia, Oregon.

Mr. Forbes Rickard, of Denver, has returned from mine examination in Wyoming.

Mr. Philip L. Foster is making one of his periodical visits to El Oro mine, Mexico.

Mr. Juan F. Brandes, after spending some time in New York, has returned to Denver.

Mr. Irving E. Rockwell, of the Minnie Moore mine, in Idaho, has been visiting New York.

Mr. I. Davidov has opened an office as consulting engineer at 52 Broadway, New York City.

Mr. Frank B. Fowler, of Culiacan, Mexico, is now recovering from illness, at Mesa, Arizona.

Dr. Joseph Hyde Pratt is examining tin and monazite deposits in North Carolina and South Carolina.

Mr. Edwin P. Arthur, Jr., of Cripple Creek, has returned from a professional trip to British Columbia.

Mr. Frank Robbins, of Los Angeles, is engaged in the examination of mines near Kernville, California.

Mr. Thomas Cornish has resigned as general manager of the Independence mine at Cripple Creek, Colorado.

Mr. Arthur Thacher, of St. Louis, has been investigating some extensive coal properties in Indian Territory.

Mr. J. Trowbridge Bailey, of the Engineering Company of America, is examining a gold mine in Alabama.

Mr. George Ridgeway has been appointed manager of the Princess Royal, at Norseman, Western Australia.

Mr. J. L. Bryson has resigned as superintendent of El Oro mines at Maybert, Cal., and is in San Francisco.

Mr. C. H. Doolittle, general manager of the Utah & Eastern Copper Co., of Shem, Utah, has returned from Chicago.

Mr. H. A. Wheeler, of St. Louis, has been examining some lead properties in Madison county, Mo., for St. Louis men.

Mr. Francis T. Freeland sailed February 2 on the *Auguste Victoria* for a tour around the Mediterranean and over Europe.

Mr. W. B. Potter has returned to St. Louis after a trip through the West, during which he examined several gold properties.

Mr. Frederick P. Clarke is now with the Imperial Smelting Co., which is building a smelting plant at Benson, Arizona.

Mr. W. W. Elliott, construction engineer, and Mr. F. M. Drescher, mining engineer, have opened an office at Prescott, Arizona.

Mr. Ira C. Boss, recently of San Francisco, has opened an office as mechanical engineer, in the Bowling Green building, New York.

Mr. H. A. Judd has resigned the management of the Lake View South and other mines at Kalgoorlie. He has gone to London.

Mr. Otto Stallman, general manager of the Glasgow & Western Exploration Co., is expected at Salt Lake, Utah, from Glasgow, Scotland.

Mr. Donald G. Forbes, manager of the Silver Cup Mines, Ltd., and the Great Western Mining Co., Ltd., at Ferguson, B. C., has resigned.

Mr. E. R. Buckley, State geologist of Missouri, is giving a short course of lectures on economic geology at the University of Chicago.

Mr. G. W. Rose has taken charge of the cyanide plant at Octave, Ariz., Mr. Fox, the former superintendent having gone to England.

Mr. F. J. Gram has been appointed managing director of the Chihuahua mine, at El Oro, State of Mexico, to succeed Mr. John Wilson, resigned.

Mr. Waldemar Lindgren has returned from Australia and is now in active charge of the United States Geological Survey work at Cripple Creek.

Mr. A. H. Lubeck has returned to the mines of the Parral Mining Co., Parral, Chihuahua, Mexico, after an absence of six months at Salt Lake, Utah.

Mr. J. W. Stearns, of Denver, who has been visiting New York and Pittsburg, sailed for the Mediterranean on the *Canopic*, which left Boston on January 31.

Mr. C. A. Ross, president of the Standard Copper Mines, has returned to England from a visit to the company's properties in the Clifton-Morenci district, Arizona.

Mr. Thomas Dennis, superintendent of the Adventure mine, Ontonagon county, Michigan, has resigned. Mr. Dennis continues as superintendent of the Rhode Island.

Mr. George H. Robinson, manager of the Tintic Mining & Development Co., had his leg broken by a fall at the Yampa smelter. He is recuperating at Salt Lake City.

Capt. Henry Jewell has severed his connection with the Oliver No 16 mine at Ishpeming, Mich., to become superintendent of mines for the Salisbury Steel & Iron Co., Utica, N. Y.

Mr. William Scallon has resigned as president of the Anaconda Copper Co. He says he severs his connection with the Amalgamated Copper Co. completely, to engage in business for himself.

Mr. Wm. P. Miller, Jr., superintendent of the Selby Smelting & Lead Co., of San Francisco, has resigned, to accept a position with the San Luis Mining Co., at San Dimas, Durango, Mexico.

Mr. F. D. Weeks, of the Engineering Company of America, left New York on February 3 for a trip to Colorado, Utah, Montana and British Columbia, during which he will examine a number of plants.

Mr. J. A. Holmes, chief of the mining department of the St. Louis World's Fair, is now making allotments of space in the nine acres within the mining building, and on the 15 acres of outside space where the working exhibits will be placed.

Mr. L. V. Powell, who has been assistant to Mr. T. F. Cole, president of the Oliver Iron Mining Co., has been appointed vice-president of the Pittsburg Steamship Co., with headquarters at Duluth. Mr. Powell was in charge of the operations of the Pittsburg Steamship Co., when it was a Carnegie concern. As assistant to President Cole, he has had much of the detail work. He was for years manager of the Palms mine, Gogebic range.

INDUSTRIAL.

The American Locomotive Works has secured from the Mexican Central Railroad orders for $1,500,000 in locomotives, the delivery to be within a period of 10 years.

The Harrell Stamp Mill Co., of El Paso, Tex., has been incorporated with a capital of $50,000, to manufacture mining machinery. J. J. Harrell is president and engineer in charge.

The Brown Corliss Engine Co., of Corliss, Wis., has just received an order from the Passaic Steel Co., of Paterson, N. J., for a 24 and 44 by 36 in. tandem rolling mill engine.

La Leonesa Mining Co., of Magatalpa, Nicaragua, controlled by George C. Emery & Co., of Boston, has let a contract for cars, hoisting engines, supplies, etc., to the Mine & Smelter Supply Co.

The Jeffrey Manufacturing Co., of Columbus, O., through its connection with the Ohio Malleable Iron Co., of the same place, is now in the field soliciting orders for high grade malleable castings.

The International Steam Pump Co., New York, has placed orders with the General Electric Co., for direct connected motors for pumps to go into Mexican mines. They will vary in size up to 200 h. p. and will be for pumps having capacities of from 100 to 1,500 gal. a minute.

The Williams Patent Crusher & Pulverizer Co., of Chicago, announces that the selling of its crushers and grinders is in charge of Milton J. Williams, as general sales agent, with offices at 225 Dearborn street, Chicago, Ill. Mr. Williams, who has been connected with the company for the past seven years, will, as soon as possible, establish branches throughout the United States and Canada.

The Monterey Electric Light & Power Co. plant, which lights the city of Monterey, Mex., is to be remodeled and enlarged. J. G. White & Co., New York, will undertake the contract. The additional equipment will be about 1,500 h. p. capacity. The General Electric Co., New York, has the contract for the electrical machinery. There will be one 500-kw. turbo-generator and two 240-kw. belt-driven alternators, also a 125-kw. engine-driven exciter generator and two small belted exciter generators.

Franz Weiss, of Mexico City, is at present in New York. He will shortly leave here for Torreon, Mex., where he will establish himself as representative of some large Mexican houses for that territory. Mr. Weiss will make a specialty of the sale of American hardware, mining machinery and contractors' supplies. Catalogues and price-lists of such articles are desired, and should be sent to 68 Broad street, New York, where Mr. Weiss will make his temporary headquarters.

The C. O. Bartlett & Snow Co., of Cleveland, O., recently received the following orders for elevating and conveying machinery: From the Iroquois Portland Cement Co., Caledonia, N. Y.; the Elk Rapids Portland Cement Co., Elk Rapids, Mich.; the Grasselli Chemical Co., Cleveland, O.; the Struthers Furnace Co., Struthers, O.; the Sandusky Portland Cement Co., Sandusky, O.; the Sherwin-Williams Co., Cleveland, O.; the Cleveland Gas, Light & Coke Co., Cleveland, O.; the Farmers' Chemical Co., Cleveland, O., and the S. Lorain Coal Co., Lorain, O. The company has also an order from the Rossland Power Co., Rossland, B. C., for mining machinery.

The H. W. Johns-Manville Co. calls attention to a material for preventing loss by fire and danger to life from the short-circuiting of high-voltage electrical wires, for which the trade mark Niagrite has been adopted. Niagrite is furnished in strips of several widths from 3 in. to 36 in., suitable for wrapping spirally on electrical cables, and is held in place with asbestos fireproof glue, thus protecting the cables from external fire and confining any internal fire. The material presents a neat and permanent finish and is not affected by atmospheric conditions. It has been adopted by the Niagara Falls Power Co., the International Power Co., Buffalo Street Railroad Co., New York Edison Co., and other important electrical plants.

The Power & Mining Machinery Co., of Cudahy, Wis., has contracted for several installations. The Elmira Water, Light & Railroad Co., Elmira, N. Y., is to have a 4-cylinder American Crossley gas engine of the opposed type, with cylinders 32 in. in diameter by 36-in. stroke, to run 138 revolutions per minute and to develop, under normal load, 1,300 brake h. p. with natural gas containing 1,000 British thermal units per cu. ft. This engine will be direct coupled to a General Electric 60-cycle alternator of the fly wheel type, and will be used for both lighting and power; the direct current for railway work being secured by a rotary converter. The Motor Engine Co., of New York City, is to have one 20 h. p. Crossley new type suction gas producer, to be installed at its Staten Island shops. The Amparo Mining Co., of Philadelphia, Pa., is to have a 190 h. p. Crossley high-speed double-cylinder gas engine, with cylinders 18½ in. by 24 in., and two high-speed single-cylinder Crossley gas engines, of 130 h. p. each, with cylinders 20 in. by 30 in. Six 9 in. by 15 in. Loomis generators, with two 10,000 cu. ft. holders; also mining machinery including crushers, Bruckner roasters, etc.

TRADE CATALOGUES.

The Station Equipment Co., of Chicago, Ill., issues a vest-pocket size catalogue containing a list of certain machinery and also data relating thereto, including generators, motors, engines, boilers, pumps, etc. The company makes a specialty of second-hand machinery.

The S. R. Smythe Co., of Pittsburg, Pa., represented in New York by Dr. Oscar Nagel, 90 Wall street, has issued a catalogue on suction gas producers and gas engines, showing the simplicity and advantages of the construction and the economy in fuel attained thereby. These producers are built in units from 5 to 150 h. p. and are said to yield 1 h. p. hour per lb. of coal.

The Yale & Towne Manufacturing Co., of New York City, is sending out an artistic 8-page folder and price list, entitled "Three Labor Savers." The labor savers referred to are, respectively, "Differential," "Duplex" and "Triplex," each of which is simply a mechanism enabling one man to lift and transport, with the aid of a traveling chain block, very heavy weights.

The Reeves Pulley Co., of Columbus, Ind., has issued a general catalogue, in which the company sets forth the advantages of its variable speed transmissions, giving descriptions and cuts illustrating the uses and construction. The catalogue is meant to supersede all former issues of variable speed catalogues published by this company, with the exception of the "Paper Machinery" edition.

The Allis-Chalmers Co., of Chicago, Ill., recently issued a 250-page catalogue, printed in Spanish, devoted to mining and metallurgical machinery. A few pages each are given to the engines built by the company, concentrating tables, calcining furnaces, crushers, etc. The advantages and uses of the machinery described and illustrated are set forth in the usually excellent style of the company's publications.

The G. W. Price Co., of San Francisco, Cal., builder of high duty pumping machinery, has issued a 7 by 11 in. catalogue of 8 pages, setting forth the advantages of the centrifugal pump manufactured by the company, one of which is that all parts of the pump are interchangeable, allowing renewal of any part at any time, at small expense. An illustration is given of the centrifugal pump direct connected to an electrical motor. A table combining dimensions and prices of pumps entire, completes the catalogue.

The Jeffrey Manufacturing Co., of Columbus, O., has issued catalogue No. 52, which will prove of vital interest to those to whom coal washing machinery is a necessity. The Jeffrey-Robinson coal washer is the particular device to which the company wishes to call the attention of readers, and much space is devoted to its description, augmented by many full page cuts of plants already installed. In catalogue No. 69, recently issued, screening machinery is given especial attention, many styles and sizes being listed.

GENERAL MINING NEWS.

Interstate Conference of Coal Miners and Operators.—Delegates representing the coal miners and operators of Illinois, Indiana, Ohio and western Pennsylvania, met at Indianapolis in January to discuss a wage scale and changes in working conditions for the year beginning April 1. Up to February 3 little had been accomplished. The joint scale committee met on February 1. The operators, in view of the great fall in coal prices since last spring, were united in demanding that wages be reduced, while the miners ignored prices and demanded a run-of-mine basis in all competitive districts, a flat differential of 7c. per ton between pick and machine mining (which would largely offset any gain in economy that the operator could hope for from machines) and a uniform wage for outside labor. It has been reported that the Indiana and Illinois operators may think it to their interest to conduct separate negotiations with the miners of their States. The convention adjourned without reaching an agreement. A sub-committee will continue negotiations.

ARIZONA.

COCHISE COUNTY.

Arizona Mining & Development Co.—This company, with headquarters in Oklahoma, has begun grading for the site of the 20-stamp mill for the Gold Treasure mines in the San Jose mountains, about six miles south of Naco. Leach and Bisbee, representing the company, have charge of the work. The mill is on the way.

Chiricahua Development Co.—This company, it is reported, is to install considerable machinery at once on a group of 23 claims in the Chiricahua mountains. James and Thomas Hoatson, who were in charge of the underground work of the Calumet & Hecla mine at one time, are reported interested.

Empire Smelting Co.—This company, at Benson, has decided to erect another furnace at their plant, which will be ready to blow in, it is reported, by spring. It is now under construction in San Francisco by the Fulton Iron Works, and will have a capacity of 200 tons daily. This will give the plant a total daily capacity of 300 tons.

(*From Our Special Correspondent.*)

Calumet & Arizona Mining Co.—This company's production for 1903 was 25,979,000 lbs. blister copper, equaling 25,719,000 lbs. refined copper. This is called a world's record for a new mine. The mine has one shaft and two 250-ton smelting furnaces in operation, but is sinking a second shaft, now nearly 700 ft. deep, and is erecting two more furnaces. New openings in the mine have been showing much ore.

Calumet & Bisbee Development Co.—This company's shaft is down 970 ft., and three drifts are being driven, one to the north to reach the line of the Lake Superior & Pittsburg Development Co.'s ground. A diamond drill will be installed in the shaft soon.

Calumet & Cochise Development Co.—This company has its main shaft down 990 ft. Sullivan diamond drills will be at work in the shaft soon. This company has 40,000 shares of $10 each, half of which have been issued, and are fully paid at par. The balance remains in the treasury. The company has also a large cash fund.

GRAHAM COUNTY.

Arizona Copper Co.—The December output of copper was 1,178 short tons.

CALIFORNIA.

AMADOR COUNTY.

Bunker Hill Consolidated.—The shaft at this mine, Amador City, C. R. Downs superintendent, is now down 1,500 ft., and the property is ready to become a producer after four years' idleness. Very little ore has been mined, but there is plenty blocked out. The new 20-stamp mill will soon be ready. There are eight Frue vanners; the ore bins hold 400 tons; the power is to be electricity.

Fremont Consolidated Gold Mining Co.—In No. 2 shaft a drift and crosscut at the 1,200 ft. level, have opened a good body of stoping ground. A well equipped and modern changing house for the men has been completed. At the mill the pulp is divided between Woodbury and Frue vanners.

Kennedy Mill & Mining Co.—At this property in Jackson, 60 stamps of the new mill and 40 of the old mill are now running. The principal work of the mine is being done through the new east shaft, and 250 men are employed.

CALAVERAS COUNTY.

Independence.—This gravel mine at Angels is about to resume work. The shaft is 200 ft. deep.

Mahala.—This mine at Rich gulch is being opened by S. E. Redmond and Wm. Casey, Jr. The ledge is only 2 ft. wide, but high grade.

Stockton Hill.—Three stamps of the mill have been started, and the new 4,000 ft. pipe line works well. The gravel is panning out satisfactorily.

Union.—This old copper mine, at Copperopolis, is about to be worked on an extensive scale.

Wide Awake.—At this mine, Railroad Flat, Geo. I. Wright superintendent, five stamps of the mill have started, and indications in the mine are favorable.

NEVADA COUNTY.

Culbertson.—At this mine in Eureka district, superintendent English has uncovered the pay shoot of a high grade 6 ft. ledge. The mine is near Graniteville, and is owned by the Syracuse & California Mining Company.

Elsie A.—At this mine, near Nevada City, under bond to George Bonney and George Hurst, the shaft is down 100 ft., where the ledge worked is 3 ft. wide. The ore is expected to mill between $15 and $20 per ton, and a Huntington mill is nearly ready.

Lamarque.—A vertical shaft is to be sunk on this Grass Valley mine, and preparations are being made to erect hoisting works.

Maybert District.—Underground work is to be resumed at the Gray Eagle, the compressor having been installed, and the mill will soon be ready. At El Oro the pumps are lowering the water in the old Yuba shaft, and repairs to the mill are nearly finished. At the Omega the new dam is about completed, and as soon as it is officially approved, hydraulicking will be commenced.

Tule Belle Mining Co.—This mine will shortly be reopened. It is equipped with hoist and pumps, and its shaft is about 200 ft. deep. New officers have been elected as follows: D. E. Matteson, president; J. M. Thomas, vice-president, and J. R. Tyrell, secretary.

TUOLUMNE COUNTY.

Clio.—This mine lies idle with a trifling attachment against it. The mine is well equipped and in condition to turn out bullion.

Densmore.—Fifteen men have commenced development work on this mine, in hope of rediscovering the vein.

Little Bonanza.—It is reported that Oliver, Grant and Deleray, owners of the pocket mine at Sonora, took out $15,000 this month, with more ore still in sight.

Norwegian.—Superintendent Hoskins has commenced the work of unwatering this once profitable mine at Tuttletown.

Starr King.—Abundant water supply being now assured, work is to be resumed on this mine.

Vivian & Concord.—A 4-stamp mill is being built on this property near Parrot ferry.

SHASTA COUNTY.

The district west of Delta has developed a number of mines now shipping ore to the smelters. The Pioneer-Black Oak, Trinity Consolidated, Bacchus, Delta, Lacconia and Pickard comprise some 30 claims. The ore is partially free milling, but is more profitable to ship to the copper smelters at Keswick. The mines of the district are now controlled by the Delta Consolidated Gold Mines Co; M. E. Dittmar, president, and Sherman T. White, secretary.

Afterthought.—The smelter on this group, owned by the Great Western Gold Co., is nearly completed. The building is almost done, and the furnace floors are in position. Machine shops and storehouses are to be built. The smelter is to be connected with the mine by a mile of narrow gauge track. A Duplex air compressor has been installed at the mouth of the main working tunnel, now in 400 ft. Power has been turned on from Volta by way of Bully Hill.

American.—This mine at French gulch, after a shut down to make improvements, is again dropping its stamps.

Gladstone.—This mine at French gulch, after an idleness of some months, due to labor trouble, has started up again with a full crew of men. During the shut-down a new 20-stamp mill was erected. Electric hoists have been put underground, and an air compressor and machine drills put in.

SIERRA COUNTY.

Several extensive tunnels are being driven in this county to tap the ancient river gravel channel which leads down the ridge from Gibsonville to La Porte, and thence to Poverty hill, Scales, Brandy City, and as far as Smartsville in Yuba county. A large portion of this long channel has never been touched, as it is covered with a capping of lava from 500 to 1,000 ft. thick, and under this the tunnel must be run. The Claybank tunnel at La Porte is now in 7,000 ft., and will soon tap the gravel. The Bellevue tunnel is finished to the gravel, which it reached at 5,000 ft. This tunnel is 8 ft. wide, intended for double track. This mine was drowned out when worked by shaft, so the tunnel had to be run. The Wild Bear tunnel near Gibsonville is now in 4,000 ft.

SISKIYOU COUNTY.

Deadwood.—This mine, near Yreka, is piping down a heavy bank of gravel.

Fernandez.—This mine on Cherry creek is being put in shape for hydraulicking, as soon as there is water enough. The claim usually yields from $15,000 to $20,000 yearly, though the season is short.

Mineatta B.—This mine, at Nolton, John C. Woods superintendent, is doing well.

Punch Creek.—This mine, owned by Geo. W. Grayson, of San Francisco, will shortly have a new mill, to be run by electric power. The mine is paying well.

Quartz Hill.—A sale of the effects of this mine under attachment has been made, the principal creditor being the purchaser. The mine is at Scott Bar, and the people started to equip it a few months ago, but failed to complete the work.

TAHAMA COUNTY.

Assays of ore from the new finds near Paskenta, where some 30 claims have been taken up recently, show returns of $4.50 per ton—quite different from the $700 per ton first reported. The ore is not free milling.

Certain river bars southeast of Red Bluff have been leased by Dr. Gates, of Oroville, and a company, of which he is representative. They are to be prospected to see if dredges can be profitably operated.

TRINITY COUNTY.

Globe.—At this mine, Dedrick, the long tunnel through the mountain will be finished the coming summer, when the mill will be moved to the Bear creek side.

Mountain Boomer and Sherwood.—The Mountain Boomer, under lease to Wm. Montgomery, and Sherwood, leased to Andred Pearsall, are both running this winter. The mines are at Denny.

Posco Rico.—At this hydraulic mine, on East Forks, a 2,000 ft. flume has been built, and a giant provided ready for the water season.

Yellow Rose of Texas.—At this property near Dorleska, Coffee creek region, a 1,200 ft. tunnel is being run, which is to be finished in May. The mine is equipped with mill, boarding houses, etc., and all buildings are connected by snow sheds.

COLORADO.

BOULDER COUNTY.

Clara Belle Co.—The mill at Allen's Park is expected to be in operation in 60 days. A 200-h. p. dynamo arrived recently. A good body of ore is reported in the Cashier shaft.

Loaf Gold Mining & Milling Co.—This is a new company. Its officers are C. L. Tripp, president; W. A. Watson, of Omaha, vice-president; W. A. Campbell, of Tecumseh, Neb., secretary; W. S. Bellman, of Boulder, treasurer. The property embraces the Ragged Top, Lafayette, and other claims, near Boulder. A few men are employed in developing the property. W. E. Ruppy is superintendent and J. W. Enos, of Boulder, general manager.

Nelly Bly.—This mill, at Magnolia, has been put in condition by J. H. Kemp. The ores will be concentrated and the tailings treated by cyanide.

GILPIN COUNTY.

(*From Our Special Correspondent.*)

Adventure.—William Huber has sold for $25,000 this group of seven lode claims in the Kansas and Wisconsin districts, to George S. Good, of Pennsylvania. The property is on the new line of the Moffat road.

Barnes.—The Horseshoe Mining Co., of Milwaukee, Wis., will arrange to resume work soon on the east slope of Quartz hill. It is reported $20,000 will be set aside for developments. The main shaft is down 700 ft., with scarcely any development below 500 ft.

Cashier Gold Mining & Reduction Co.—This company owning and operating the Pittsburg-Meeker Golden Wedge groups in Russell district, paid an extra dividend January 15, of $2,400. It paid nearly $15,000 for 1903. The property is worked entirely with leasers. Arrangements are being made to sink the shaft 100 ft., making 725 ft. in all, and the company will soon consider larger equipment. B. L. Campbell, Central City, is superintendent.

Freedom.—Milling ores shipped this week gave about 6 oz. gold to the cord. The water is being taken out of the main shaft, down 822 ft., which will be sunk to 1,000 ft.

Ingalls Gold Mining & Leasing Co.—This company is figuring on a hoist, boilers and air compressor, and larger buildings, the top improvements to cost around $10,000. The company may decide on a plant for treating its own ores. A large amount of development work is done, and the property is reported to be nearly in shape for regular production. W. Ballantyne, Central City, is manager.

Kane.—This group of seven claims at Wide Awake, owned by M. T. Kane, of Perigo, has been bought by Boulder men, who will develop at once. W. H. Myers, Gilpin, will be in charge.

Roderick Dhu Gold Mines Co.—This company is taking out from 20 to 25 tons per day out of its Protection shaft on Quartz hill, giving average returns of about 2 oz. gold per cord, besides tailings running up to $15 to the ton. The company will lease a mill on North Clear creek to treat its ores, and will start sinking from the 334-ft. level to the 400 ft. workings on the Roderick Dhu. J. C. Fleschhutz, Central City, is manager.

Star of Gilpin.—Denver and local men will install a hoisting plant and suitable top-buildings, and developments are to be pushed.

LAKE COUNTY—LEADVILLE.

(*From Our Special Correspondent.*)

Caribou.—From 100 to 150 tons of good iron ore are shipped daily, while some good lead ore is being mined.

Chippewa.—The upper shaft has opened a body of ore, shipments from which show 2 oz. gold and 60 oz. silver.

Chrysolite.—Several of the shafts are operated under lease and are shipping good iron ore carrying fair grade silver values. No manganese ore is shipped.

Dennis.—In the 150-ft shaft a drift run at 100 ft. has encountered a streak of rich silver ore.

Gilt Edge.—This property is now shipping through No. 1 shaft from an upraise from the 500 ft. level, a zinciferous material which is handled by Manager Deaner at the old Globe mill, near by.

Harvard.—The new 400 ft. shaft will be started at once. A heavy plant of machinery will be installed late, and connections made with the El Paso shaft.

Midas Mining Co.—The Sixth Street mine lease has been transferred to this company. The Sixth Street has for years been under lease to the Phoenix Mining Co. It is on the old Alice placer, and is owned by the Leadville Mining Tunnel & Drainage Company.

Rhodesia Mining Company.—This company is to build a mill at once.

OURAY COUNTY.

American Nettie.—This mine, near Ouray, will resume about May 1.

Bob Tail.—This mine, in Red mountain district, near Ouray, has a 14-ft. body of gold ore blocked out. It has several thousand feet of development work done, but has never shipped a pound of ore. The new mill will be completed within two months.

Revenue.—This mine, near Ouray, will resume about July 1 with from 300 to 500 men. The new 1,000-ft. shaft on the Virginius vein is going down rapidly. The ore is taken out by tram trains operated by electricity, directly to the big mill.

SAGUACHE COUNTY.

Steel Cañon Mining, Milling & Developing Co.—The following officers were elected recently for the ensuing year: P. R. Hartel, president and general manager; Luda Harp Hartel, vice-president; J. E. Bozor, of Pueblo, secretary. This company operates a group near Villa Grove. The plans for a concentration mill are now completed. The ore carries lead, silver and copper.

SAN JUAN COUNTY.

Royal Mining & Investment Co.—The Sultan Mountain Mining & Milling Co. has given a bond and lease to this company to the Waterfall, Sultana and other claims, consideration being $13,000. The group lies on the eastern slope of Sultan mountain, near Silverton, so that development through the King tunnel can be done at small expense.

SAN MIGUEL COUNTY.

(*From Our Special Correspondent.*)

The Telluride district has survived killing conditions, and is beginning to resume activity on a sounder and healthier basis than ever. With the agitators out of the community and a steady, hard-working set of men in the mines the mineral output is rapidly approaching the normal. The military is still in control and martial law prevails.

Alta.—This property is operating steadily with an increasing force. Manager Koch, of Telluride, has returned from Milwaukee. The mill has been using 20 stamps, but 10 more will be in commission soon.

Butterfly-Terrible.—A boiler and engine were recently installed, and the mill is now run by steam, giving a plentiful water supply for milling. Work underground is being pushed on a large body of high-grade ore. J. F. Keating, of Ames, is resident manager.

Japan.—The erection of a reduction plant at Pandora is contemplated. A tramway will be erected between the mine and mill. The Valley View and Ajax veins, will be thoroughly explored. The present work consists largely in development. T. Walter Beam, of Telluride is manager.

Liberty Bell.—A storm snapped one of the stationary cables of the tramway between the mine and mill, the damage aggregating $1,000. The mill is temporarily idle. Manager Chase, of Telluride, has been contemplating adding 20 stamps to the 40 that have been dropping for the past month and more. There is plenty of ore on hand, and a full complement of men is at work.

Ophir Consolidated.—The richest ore ever found, averaging from $12 to $20 per ton, is being mined from the Ida vein. Prospects for this year are better than ever. No difficulty is had in securing men. Henry R. Buckley, of Telluride, is manager.

Smuggler-Union.—A full force is at work. A number of soldiers who have been relieved from duty have secured employment at the Smuggler. They have been sworn in as deputy sheriffs. Bulkeley Wells, of Telluride, is general manager.

Tomboy.—The force of men is steadily increasing, and mule trains laden with concentrates travel from the mill to the depot every day.

TELLER COUNTY—CRIPPLE CREEK.

(*From Our Special Correspondent.*)

C. K. & N.—This mine is located on the Raaler claim just west of the El Paso mine, on the west slope of Beacon hill. It is well equipped, having one boiler of 125-h. p. and one of 120-h. p. It has 8 new machine drills, making 12 in all. The shaft is down 500 ft. to water level. Ore was first cut on the 300-ft. level, and 55 men are now mining ore on the 375-ft. and 425-ft levels. In 1903 the reported output was 700 tons per month of an average value of 3 oz. per ton. A new find of calaverite is reported which promises to equal the rich pocket found several months ago. The returns are said to be very high indeed, according to E. G. Taylor, manager. The Old Gold shaft is about 325 ft. southwest from the C., K & N. on the same vein. It is 380 ft. deep; 50 men are employed in three shifts. The air for the machine drills is furnished from the C. K. & N. plant. One is mined from the 330 and the 380-ft. levels. The average output for the past 8 months was about 400 tons per month.

Findley.—The company held its annual meeting in Colorado Springs recently. The following directors were elected: John H. Hobbs, John J. Key, Clarence Edsall, L. G. Carlton and E. C. Newcomb, all Colorado Springs and Cripple Creek men. John H. Hobbs was chosen president and treasurer, Clarence Edsall vice-president and secretary. The retiring directors are: George R. Buckman and E. A. Richards. The financial condition of the company is good, and the mine development more promising than anticipated. At a depth of 1,400 ft. water cut off operations. The company will begin work on February 1 with a force of 125 men and a fine plant of newly-installed machinery with double-decked cages.

GEORGIA.

LUMPKIN COUNTY.

Etowah Gold Mining Co.—Work on the Josephine mine is progressing well, and the water supply will soon be ready.

Jumbo.—A new vein, carrying sulphurets, has been cut in this mine. Mr. J. F. Moore, of Dahlonega, has charge of the work.

IDAHO.

IDAHO COUNTY.

East Dewey.—This concern, owning a large group north and east of the Sunnyside, has resumed work in two tunnels. Thomas Mathews is superintendent.

Franklin.—Larson & Greenough have bought this mine, near Thunder mountain. It has a 10-stamp mill and about 2,000 ft. of underground work completed.

H. Y. Climax.—A 50-stamp mill and a 30-ton cyanide plant is reported ordered for this property near Thunder mountain.

Idaho Copper Mining & Smelting Co.—A 10-drill Rand air compressor and an 80-h. p. engine are being installed on this property at White Bird.

Montana-Idaho.—A Ruble elevator is to be placed on the Crooked Creek placer, it is reported, at Dixie. The company owns 320 acres of undeveloped placer property in the Clearwater basin. The Crooked Creek placer has a reported indebtedness of $9,000. E. B. Simmons is secretary.

OWYHEE COUNTY.

Trade Dollar Extension Mining Co.—This company, of Silver City, has placed an order for an Ingersoll-Sergeant 50-h. p. air compressor and drills.

SHOSHONE COUNTY.

(*From Our Special Correspondent.*)

The production of the Cœur d'Alene galena mines for 1903, as compiled from practically official reports, was as follows:

Mine.	Ozs. Silver.	Lbs. Lead.
Federal	2,034,592	93,540,000
Morning	686,700	35,475,606
Bunker Hill & Sullivan	17,532	34,882,560
Hercules	900,000	13,000,000
Hecla	414,000	14,221,000
Frisco	271,050	9,165,000
Hunter	105,000	3,220,000
Coeur d'Alene Dev. Co.	76,800	1,892,000
California Con.	15,571	861,112
Totals	6,021,145	206,257,278

The American Smelting & Refining Co. has closed a six-year contract with the Federal Mining & Smelting Co. to handle all of its ores.

Morning.—This mine, in the Cœur d'Alenes, has closed a new rate contract with the American Smelting & Refining Co. for eight years. It is understood that the new contracts with the Morning virtually provide for paying 81% of the full assay value. Smelting contracts, it is understood, remain at $8 a ton.

WASHINGTON COUNTY.

Iron Springs Mining Co.—A 20-ton cyanide plant, it is reported, will be added to the equipment on this property in the Rapid River district near Weiser. Preparations for the building are now underway. It may be in operation by August 1. The mine and all the company's buildings are lit by electricity. Twenty-six buildings, including a large boarding house, were erected during the fall and winter. A 3,000 ft. hoist is in operation, and about 50 men are employed.

MICHIGAN.

COPPER—HOUGHTON COUNTY.

(*From Our Special Correspondent.*)

Calumet & Hecla.—No. 19 shaft, which cut the Kearsarge amygdaloid, is a test opening 1,500 ft. south of No. 1 shaft of the Centennial. No. 20 shaft, the second Kearsarge opening, is down 45 ft. and bottomed on trap rock. A hoisting engine and headsheave are being put in and an air pipe line extended from No. 17 shaft. Sinking will continue until the lode is struck.

Centennial.—Negotiations have been pending for the Arcadian Copper Co.'s 3-head mill at Grosse point. The deed to the mill site and everything thereon, in favor of the Centennial Copper Mining Co., has been at Houghton. The mill site consists of 406 acres, and has a water frontage of 1¼ miles. The mill is of steel, 132 by 213 ft. It has steel rock bins, while a steel trestle leads from the bluff behind the mill to the bins. The three heads are capable of stamping 500 tons of rock each daily. The equipment comprises 110 jigs and 9 double-decked slime tables of the Allis-Chalmers type. The boiler house is of steel, containing five high-power boilers, and has a brick-lined steel stack. The steel pump house contains a 15,000,000-gal. Nordberg pumping engine. There is a coal shed and other buildings.

Franklin.—No. 2 shaft at the Junior branch is sinking at 250 ft. It is expected to be completed to the fourth level this month. A raise is now being made from the seventh level south of No. 1 shaft on the line of No. 2. It should reach the fifth level by February 15. When No. 2 reaches the fourth level it will be continued, while raising from the fifth is under way. It is expected that the shaft will be completed to the seventh level by April. Rock shipments will start from No. 2 early in the spring over a spur to be built from the Mineral Range railroad.

Isle Royale Consolidated.—This company has let a contract for a stone and cement dam in the 14th level connecting No. 1 shaft with No. 2. The company may abandon the burned out No. 1 shaft and allow it to fill with water.

Osceola Consolidated.—Work at the Tamarack Junior branch has stopped, and the property abandoned. The single drill which was sinking a winze in the Calumet conglomerate lode from the 12th level of No. 2 shaft has been withdrawn. The mine was originally part of the Tamarack, but was set aside 15 years ago, and a separate company formed with a capitalization of $1,000,000. In 1897 it was absorbed by the Osceola Consolidated. The property consists of three forties in the eastern part of section 11. The Calumet & Hecla owns the lands north, south and west, and the Centennial the mile square tract on the east.

Quincy.—Work is still suspended, owing to the strike of the trammers over a $5 cut in wages. About 1,800 men are idle.

COPPER—KEWEENAW COUNTY.

(*From Our Special Correspondent.*)

Mohawk.—The third head at the mill on Traverse bay is in commission. As soon as it is running smoothly the other two heads will be repaired in turn. They have been dropping two years. Rock shipments will probably not be increased until late in March. The new steel shaft and rockhouse at No. 4 being erected by the Wisconsin Bridge & Iron Co., of Milwaukee, Wis., is nearly finished. Underground the miners are starting stopes.

Phoenix.—The miners have cut up a 26-ton mass of copper, which has been shipped to the Quincy smelters. The week previous an 8-ton mass was hoisted. The one-head mill is treating about 200 tons of rock daily.

COPPER—ONTONAGON COUNTY.

(*From Our Special Correspondent.*)

Adventure Consolidated.—Capt. Thomas Dennis has resigned as superintendent. It is not known who will succeed him. Work is confined to No. 1 shaft, and rock shipments average 300 tons daily.

IRON—MESABI RANGE.

(*From Our Special Correspondent.*)

Agnew.—This mine is installing a 900-gal. pump as the water is coming up since pumping stopped at the Penobscot, close by.

Burt. — Stripping by Winson & Dear has stopped, but will begin in March. The mine has made a wonderful record in costs for its year as a stripped proposition, and is to be heavily operated during 1904. A portion of the Burt belongs to the State school funds, which get 25c. on every ton mined.

IRON—MARQUETTE RANGE.

Bessemer Iron Co.—This company, composed of Duluth and Houghton men, will soon have a diamond drill working, adjoining the Taylor mine, south of L'Anse, and will add two more later. The company has pits 35 ft. in ore. J. H. Wade is in charge.

Cleveland-Cliffs Co.—This company mined and shipped in 1903 1,596,727 tons of ore from its Marquette range mines.

IRON—MENOMINEE RANGE.

Aragon.—A new compressor plant, built by the Sullivan Machinery Co., is being erected at this mine, Iron Mountain. The machine is 210 h. p., and for 150 lb. steam pressure, and is to furnish air to Porter compound mine locomotives at 850 lb. pressure. The new steel shafthouse at No. 5 shaft went into commission recently, and is the largest and most expensive structure of its kind on the Menominee range, requiring about 150 tons of steel. Underground, at the ninth level, a diamond drill has been installed.

Beta.—This mine, near Iron river, will probably ship this year. It has been unwatered, a powerful plant of machinery installed and the shaft is going down. The mine has been under option to E. F. Brown, of the Pewabic Co., for some time.

Pewabic Mining Co.—Contracts for 500,000 ft. of mine timber have been let by this company.

MINNESOTA.

IRON—MESABI RANGE.

(*From Our Special Correspondent.*)

The Northern Pacific Railway, which, under the name of the Lake Superior Co., controls the old land grant of the St. Paul & Duluth railway, has stopped drilling on the latter's lands in T. 55, R. 12, where it has been working all winter. Nothing was found.

Duluth & Superior Iron & Steel Co.—This Minnesota concern is trying to sell stock. The advertisements say the company has a mine with 150,000 tons of ore on the "dump," and is able to mine this year 300,000 tons at a profit of $1 a ton. This "dump" the president of the company admits, is "covered by from 10 to 15 ft. of gravel at present," which can be taken off easily! In other words the mine has not been opened, and the ore will be on the dump when it is put there. The property is a part of a quarter of section 15, T, 59, R, 14, 1½ miles east of the Duluth & Iron Range road, explored by D. T. Adams last summer. He found what he thinks amounts to 225,000 tons of ore in all. He abandoned the land. In addition the company has several 40 acre tracts in the southwestern part of T, 58, R, 19, some of which may be on the ore bearing formation. The company suggests a profit of 500% to purchasers.

Lincoln.—This mine, at Virginia, is installing an electric tramming plant that will handle up to 2,000 tons a day. The mine will take on men in two months, and will produce nearly as much ore as last year.

Longyear Mesabi Land & Iron Co.—This company is drilling on section 3, T, 58, R, 15, and has several holes in ore. This company is preparing for a townsite on section 10, in opposition to the village of Aurora, which was started last fall, and has been drilling the ground to find if it contained ore. One hole is 1,068 ft. deep, the upper 700 ft. in surface and slate, and the balance in taconite, bottoming in granite. Some rich ore concentrations in the taconite may reverse some of the theories held by highest authorities as to the formation of the Mesabi ore bodies. Three drills are now working on this forty, and three more will be added soon.

Pitt Iron Mining Co.—Mine timber is being placed at the Miller mine in section 4, T, 58, R, 15. This mine was opened last fall, and closed at the beginning of winter. New boilers, a large Prescott pump, and other equipment will be placed.

Quincy.—A little ore has been found in these lands, on the northeast side of section 24, T, 58, R, 18, which had been drilled fruitlessly some time ago by E. C. Garlick, of Cleveland. There is no indication yet that the find is of importance.

MISSOURI.

MADISON COUNTY.

(*From Our Special Correspondent.*)

American Lead Co.—This company is making arrangements to double the capacity of its present 250-ton mill. It is also prospecting its Southern grounds, preparatory to sinking another shaft. The No. 1 shaft, which was rather wet at first, is now only making about 200 gals. per minute, though it is 240 ft. deep.

Catherine Lead Co.—This company recently opened a large cave filled with mud that is quite rich in heavy, coarse galena. The mill is being remodeled. Smith Brickey is president.

Jackson Revell.—This old silver mine was reopened last year by Fredericktown men, who sank the shaft 170 ft., and did some drifting on the vein, a vertical fissure in the porphyry carrying argentiferous galena and zinc-blende. The property is under option to St. Louis men.

MONTANA.

FERGUS COUNTY.

(*From Our Special Correspondent.*)

Kendall Gold Mining Co.—A dividend of $50,000 has been declared, double the amount usually paid. The mill is treating 350 tons per day.

LEWIS & CLARKE COUNTY.

(*From Our Special Correspondent.*)

Whitlach-Union.—Carrol & Martin, of Helena, have secured a lease and bond on this old gold producer at Unionville that has remained idle for 20 years. It was one of the greatest gold mines in the State at one time. The ore is free milling. The eastern owners have for years refused all offers for the property. A large force of men will start work at once. The old openings produced several millions.

MADISON COUNTY.

(*From Our Special Correspondent.*)

Mining activity is greater than for some years. Several new cyanide plants are in operation, and others are contemplated. Near Virginia City new mines are coming to the front. Considerable outside capital is being invested in mines that have lain idle several years.

Alder Gold Mining Co.—The new 60-stamp mill at Summit, 8 miles above Virginia City, is about completed. Ten of the stamps will probably go into commission by March 10. The tailings are to be cyanided.

Chicago Mining & Development Co.—This company has been operating for five years the Mollie Gibson dredge on a lease in ground belonging to the Courey Placer Mining Co. January 1 the lease expired. As the Courey people do not wish to renew the lease the Gibson's owners are looking for a new location.

Courey Placer Mining Co.—This company has had two dredges at work at the mouth of Alder gulch, 8 miles below Virginia City, so far this winter. The management intends to continue unless the weather should become extremely cold. A new dredge will be built in the spring. The management will experiment with electric power for the new boat.

Dakota Mining Co.—This company, composed of Grand Forks, N. D., people, has been formed to take over the General Shafter mine, near Summit, 8 miles above Virginia City.

Grant Gold Mines.—The new 15-stamp mill, ¾ mile up the gulch from Virginia City, has been in operation for 30 days. The ore is run over plates to catch the free gold. Six 6-ft. vanners catch the sulphides, which amount probably to 2% of the crushed material. The tailings from the Frue's go to four steel cyanide tanks, 80-ton tanks, where the tailings are treated by the Webb pneumatic process. A Mr. Bell has charge of the mill.

Pacific and Easton.—At these properties, owned and operated by the Elling estate, the second class ore is treated at the mill. The first class is sent to outside smelters for treatment.

SILVER BOW COUNTY.

(*From Our Special Correspondent.*)

Amalgamated Copper Co.—The Supreme Court has reversed Judge Clancy in the case of John MacGinnis vs. this company, thereby holding legislative bill No. 132 constitutional. This allows the Amalgamated to hold stock in its sub-companies, receive dividends there and vote stock. The injunctions on the Boston & Montana and Parrott companies against paying dividends to the Amalgamated are dissolved. The decision is favorable to the Amalgamated on all points. The decision apparently means that the attorney-general and not MacGinniss is the party to bring any suit against Amalgamated interests as to the legal standing of its companies in Montana, and the case is "remanded for further proceedings not inconsistent with the Supreme Court's views." MacGinniss will have 15 days in which to move for a rehearing, and if no action is taken the Amalgamated may receive its dividends from Boston & Montana and its other companies. House bill No. 132 was an Amalgamated measure passed after the beginning of the MacGinniss litigation and permits the holding of stock in one Montana corporation by another corporation. The Supreme Court of Montana evidently holds opposite views upon the trust question to that held by the United States Attorney-General in the Northern Securities case.

Butte Copper Mining & Smelting Co.—This company has been organized to operate the Dutton ground adjoining Heinze's Glengarry property. The property produced under Patrick Wall's management about $300,000 during the last three years. The capital stock is 600,000 shares at $1 each. Patrick Mullins, Mayor of Butte, is president of the company; Frank H. Cooney, vice-president; Patrick Wall, treasurer and manager; Sam Hall, secretary. The shaft, now 250 ft. deep, will be sunk to 750 as soon as possible. Heavy machinery will be installed.

Pittsburg & Montana Copper Co.—It is understood that the fires will be lit in one furnace of the smelter within a few days.

Reins Copper Co.—The shaft on this property, at Meaderville, is 600 ft. deep. Stringers of copper ore are quite numerous in the bottom. Sinking will continue to the 700 before cross-cutting will commence.

NEVADA.

NYE COUNTY.

(*From Our Special Correspondent.*)

Ohio Tonopah Mining Co.—This company, owning 5 claims 850 ft. southwest of the Tonopah Mining Co.'s property, has sunk a two-compartment shaft 800 ft. and from the 770-ft. level has done 1,300 ft. of cross-cutting and drifting on five distinct veins; in the south cross-cut, 592 ft. from the shaft, a fissure over 10 ft. wide has been opened that in places carries good values, the quartz bearing a marked resemblance to the Mizpah vein. The development is the first discovery of values at depth in this direction. It is distant from the Tonopah Mining Co.'s main shaft 3,600 ft. The company is controlled in Cleveland and Youngstown, O.; S. A. Knapp being general manager in Tonopah.

Tonopah Belmont Development Co.—This company has shipped 50,404 lb. of first and second class ore which netted $2,293, the values being 151 oz. silver and 1.9 oz. gold per ton.

Tonopah Milling, Mining & Development Co.—Manager M. P. Boss, of the 10-stamp mill, has shipped first bullion, 6 bars, valued at $5,500, a partial clean up of the first crushing of leaser's ore. The mill will continue to run on ore from the leases on the Mizpah vein. The mill cost $75,000.

PENNSYLVANIA.

ANTHRACITE COAL.

The United States Geological Survey has been conducting experiments to find out what effect mine water and culm had upon the waters of the rivers and creeks into which this refuse was emptied. Prof. Dean, of Wilkes-Barre, has made, under the direction of the Survey, a number of careful analyses of the water of the Susquehanna and Lackawanna rivers. The Wilkes-Barre *Record* gives the following results:

The Susquehanna river, above the mouth of the Lackawanna, contains a considerable proportion of organic matter. Lackawanna river contributes to the Susquehanna immense amounts of sewage from Scranton, Carbondale and smaller places, while below the entrance of the Lackawanna there is poured into the Susquehanna the sewage of Wilkes-Barre, Pittston, West Pittston, Kingston, Plymouth and Nanticoke. In addition there is turned into the stream an unusually large quantity of fine coal dust. Such is the precipitating effect of the large quantities of acid mine waste turned into the Susquehanna from the various shafts that the sewage water contains less putrescible matter at the Nanticoke dam, a short distance below the city of Nanticoke, than it does above the entrance of the sewers of the cities named. Enormous quantities of culm are also precipitated, except when the river is very high, and on the whole the water is as good from a chemical standpoint at Nanticoke as it is above the mouth of the Lackawanna, though in the distance of 16 miles the river is subjected to the sewage pollution of 230,000 people.

OREGON.

BAKER COUNTY.

(*From Our Special Correspondent.*)

Eureka & Excelsior.—This property, in which Jonathan Bourne, of Portland, is interested, is working 60 men. Rich ore is being shipped from an upper level.

Golden Wizard.—The 20-stamp mill in the Deer Creek district, is framed and machinery for it is on the ground.

North Pole.—This property is working 80 men, is shipping much rich ore and running its 40-stamp mill.

Turnagain Arm Co.—Superintendent Townsend, of the California mine, has resigned, to take charge of a mill at Gold Hill, and is succeeded by Manager Bellmain. The California mill and roaster are running full capacity.

UTAH.

Coal Production.—According to Gomer Thomas, State mine inspector, the output of coal in 1903 was 1,845,550 short tons and of coke 162,204 short tons.

BEAVER COUNTY.

(*From Our Special Correspondent.*)

Copper Mountain Mining & Milling Co.—A bond and lease has been given to W. J. Bowring, of Salt Lake City, calling for $125,000 before December 19, 1905. High-grade shipping ore was opened recently. Shipments will be made at once with three shifts working daily.

JUAB COUNTY.

(*From Our Special Correspondent.*)

Tintic Shipments.—During the week ending January 29 shipments were: Ajax, 3; Bullion-Beck, 8; Carisa, 1; Centennial-Eureka, 55; Dragon Iron, 15; Eagle & Blue Bell, 2; Gemini, 14; Grand Central, 12; Salvator, 17; South Swansea, 2; Tetro, 4; Uncle Sam Consolidated, 6; Yankee Consolidated, 8; Uncle Sam (concentrates), 1.

SALT LAKE COUNTY.

(*From Our Special Correspondent.*)

Bingham Consolidated Smelter.—Copper shipments for the fiscal week ending January 29 aggregated about 180,000 lb.

Utah-Apex.—Four feet of ore have been encountered in the Pawnee tunnel assaying 5.5% copper, $4 gold and 5 oz. silver.

Utah Consolidated Smelter.—Copper bullion shipments week ending January 29 aggregated about 350,000 lb.

Utah Copper Co.—Superintendent F. G. Jenny will start the new 500-ton concentrating mill February 15.

United States Smelter.—Shipments of copper bullion during the week ending January 29 aggregated about 181,000 lb.

SUMMIT COUNTY.

(*From Our Special Correspondent.*)

Daly-West.—The new slimes plant is expected to be ready by April 1. The General Electric Co. is installing the electrical equipment.

Pinyon Ridge Mining Co.—This company will develop property at Park City owned heretofore by James McGregor, of Salt Lake. The officers are: President, James McGregor; vice-president, Frank McKeen; secretary, Samuel C. McKeen, of Terre Haute, Ind. The capital stock is 600,000 shares of $1 each.

Woodside.—An important strike has been made in this property. W. Mont Ferry, of Salt Lake, is manager.

WASHINGTON.

FERRY COUNTY—REPUBLIC.

(*From Our Special Correspondent.*)

The railways announce tariffs on eastern Washington ore to the coast smelters as follows: Republic to Seattle, Everett or Tacoma, Wash., or Liverpool, B. C., $4. From points along the Central Washington, which covers Cedar Canyon camps, to either Tacoma or Everett, Wash., $5.50. Both rates are based on ore of less than $100 value in 15-ton car lots.

Mountain Lion.—Considerable work has been done in the mill. The installation of machinery for the Hendryx process has been slower than expected, but the plant will be ready soon. About 30 men are employed around the mine and mill. The stoping of ore is pushed. Shipments to the smelters continue. It is said there are 1,000 tons of ore broken on the 400-ft. level. A glory hole is being sunk near the main shaft.

Republic Power & Cyaniding Co.—Suit has been brought to foreclose the $200,000 bond issue given by this company on all its property, which includes the big mill at Republic. The suit is brought by the American Loan & Trust Co., of Boston, as trustee of the bondholders. Coupled with the defendant is the name of William George Campbell Lanskail, secretary of the Republic Co., and assignee of its property under a voluntary assignment recently made.

OKANOGAN COUNTY.

(*From Our Special Correspondent.*)

Favorite.—A large and valuable body of ore is reported encountered.

Night Hawk.—The lower tunnel is in 1,400 ft. Several small stringers of ore have lately been encountered. A small steam engine and exhaust fan have been supplied for ventilation.

Ruby.—The drifts on the lower tunnel level have been opened for 300 ft. north and 400 ft. south. About 750 tons of ore, broken down, are available for treatment. The Golden Zone mill has been reconstructed, and has started crushing. Trolley buckets have been purchased

for an aerial wire tram. The Ruby mine is on Mount Chapacca.

Similkameen Falls.—The tunnel, water and wasteways in hard conglomerate have been completed, and the gates are being put in. Plans for an electrical power and lighting plant are being prepared. The machinery, with the exception of a few small parts, is now on the ground.

FOREIGN MINING NEWS.

AFRICA.

RHODESIA.

The total gold output in December is reported at 18,750 oz. bullion. This makes the total for the year 231,872 oz. bullion, against 194,268 oz. in 1902; an increase of 37,604 oz. The bullion reported in 1903 was equal to 172,899 oz. fine gold, or $3,573,822 in value.

CANADA.

BRITISH COLUMBIA—BOUNDARY DISTRICT.

Boundary Ore Shipments.—For the week ending January 23 shipments aggregated 15,327 tons, as follows: Granby, 11,820; Mother Lode, 1,296; Emma, 792; Senator, 132; Oro Denoro, 1,023; Athelstan-Jack Pot, 264. Total for the year to date, 47,757 tons. The Granby smelter treated 12,556 tons of ore, making 36,406 tons for the year to date.

BRITISH COLUMBIA—EAST KOOTENAY DISTRICT.

Crow's Nest Pass Coal Co.—The coal output for 1903 from the collieries at Coal Creek, Michel and Morrissey, is reported as 661,118 tons, compared with 441,236 tons in 1902. The coke output was 167,739 tons, against 120,777 tons in 1902. During 1903 424 coke ovens were in operation at Coal Creek, 341 at Michel, and 148 at Morrissey. The company has under construction 123 new coke ovens at Michael and 92 at Morrissey, making a grand total of 1,128 ovens.

BRITISH COLUMBIA—ROSSLAND DISTRICT.

(*From Our Special Correspondent.*)

Rossland Ore Shipments.—For the week ending January 23 shipments were 9,620 tons, as follows: Le Roi, 5,600; Centre Star, 1,620; War Eagle, 1,200; Kootenay, 240; Jumbo, 280; Le Roi No. 2, 380; Le Roi No. 2, milled, 300. Total for year to date, 31,818 tons.

Jumbo.—This mine at Rossland is shipping 40 tons a day to the Granby smelter, at Grand Forks. The ore, which carries a heavy percentage of iron, formerly went to the Northport smelter. The mine is working 30 men under M. R. Galusha, manager.

MEXICO.

COAHUILA.

(*From Our Special Correspondent.*)

Ignacio Rodriguez Mining Co.—This company has a Leschen aerial tramway 8 km. long from the Cigarero mine near Jiminez to Baca station, on the Mexican Central. It has a capacity of 300 tons a day, which may be increased to 500. The cable is 1.125 in. thick and the traction wire is .875 in. thick. The mine is a good producer of lead carbonate ore. It has been somewhat handicapped by having to send all ore on muleback to the station down a very bad roadway.

SOUTH AMERICA.

VENEZUELA.

After five years of litigation the Supreme Court has rendered its judgment in the case of the Felicidad Asphalt claim, deciding against the Warner-Quinlan syndicate, of Syracuse, N. Y., and in favor of the New York & Bermudez Co. The court holds that the Felicidad mine, for which Warner & Quinlan paid $40,000, was bought by them from Italians and Venezuelans without guaranty of the validity of title. This purchase, the court declares, was illegal and null, because the mine was situated on ground that was the property of the New York & Bermudez Co., which had the only lawful concession and had the right to mine asphalt there under a prior contract.

MINING STOCKS.

(Full quotations given on pages 224 and 225.)

New York, Feb. 3.

This has been a week of agreeable surprises—Comstock shares showed renewed hope on payment of Ophir's first dividend in 24 years, and Amalgamated Copper rejoiced over the decision of the Montana Supreme Court, given on another page. Another feature was the initial call on February 1 of the Wall Street Mining & Stock Exchange in room 18, 35 Wall street, New York. It is said that about 50,000 shares were traded in during the day. Of the "representative" stocks called, several have not enough merit to be listed an any of the old exchanges, while a few are already on the list of the Boston or Colorado Springs boards. It is intimated by W. R. McDowell, the secretary and manager of the new exchange that "as soon as we are running smoothly we will list stocks ourselves." There are 25 members, which the exchange hopes to increase to 500 at $250 each. The executive committee consists of Donald C. Catlin, Frederick W. Webster and Charles W. Chapman.

On the regular exchange Amalgamated Copper has been favorably influenced by the Boston & Montana decision, and on February 1 jumped over 3 points to $50.75, on sales of nearly 100,000 shares. This improvement, however, is not up to the expectations of those shareholders who can recall that the injunction restraining payment of the Boston & Montana dividends was one of the chief reasons for Amalgamated's collapse about two years ago. On the other hand, speculators raise hopes that as the dividends declared by the Boston & Montana Co. form the main source of Amalgamated's revenue, there is now better chance for an increase in its rate. Anaconda was little affected by this decision, and sold in a small way at $18@$18.25.

On curb Greene Consolidated of Mexico, has been somewhat erratic, owing to the controversy as to how money shall be raised to liquidate the company's indebtedness. The bond issue now seems to have a majority vote. At any rate brokers are booking orders for the stock at $11 @$12.50, and have scooped in "rights" at $40 @$60, for people who are said to be seeking proxies for the coming shareholders' meeting.

In the Comstock section Ophir continues to sell at a premium, having paid a 25c. dividend, after collecting assessments regularly since 1880. Other stocks are moderately dealt in at normal prices.

Colorado shares are quiet, Elkton, of Cripple Creek, moving up to 60c. Horn silver, of Utah, is in better form at $1.25.

Boston. Feb. 2.

(*From Our Special Correspondent.*)

A survey of the prices of copper shares from week to week certainly leads one to the belief that, although efforts may be made from time to time to put them higher, there is a stronger power that holds them down. This feeling is gaining ground and only those who are the principals can tell when this iron hand will be removed. Perhaps those guiding spirits who make and unmake markets have certain plans maturing which would be upset in the event of any great bullish enthusiasm. At times things have looked pretty good for a boiling market, but the enthusiasm did not hold long for some unseen or unknown power always steps in and crushes the willing worker. Even the favorable decision in the Amalgamated's Montana case put but little life into stocks and then only in a very few cases.

Amalgamated sold over $1 above the New York price, Tuesday morning, at $53, but it was not long before they were at a parity. Lawson continues to give forth bullish utterances on Amalgamated and predicts the utter annihilation of the Heinze forces.

Outside of Amalgamated, Parrot was the cynosure of all eyes, as would be expected from the Montana decision. The stock sold at $20.75 Monday, but rallied to $23.75 that day. The following day it opened at $27 and touched $29, with re-action to $25. No dividends have been paid by the Parrot Company since January, 1902, when 50c. was distributed. The Parrot holdings by the Amalgamated Company are unknown.

Colorado Springs. Jan. 29.

(*From Our Special Correspondent.*)

The past week has been rather a sensational one on the local mining exchange, and the volume of trading has been greater than at any time during the past eighteen months. Prices advanced rapidly the first of the week, but an expected reaction has set in the past day or two. The rich discoveries recently made in the Cripple Creek district have given investors renewed confidence in the camp's possibilities, and while the market is weaker at the close prices are still much higher than those prevailing during the past few months.

The strike made on the W. P. H. claim on Ironclad hill is proving to be fully as rich as was at first supposed. The strikes reported in the Granite and El Paso properties are of more than ordinary proportions, and the Portland, Elkton and Matoa companies report finds of good ore-bodies. Prospecting has received additional impetus all over the camp.

San Francisco. Jan. 27.

(*From Our Special Correspondent.*)

The market for the Comstock shares has been active, and showed some excitement. Buying has been on a larger scale than usual, and brokers begin to feel some encouragement. Ophir, of course, led the way, going up at one time to $4.65, but settling down to a range of $4@$4.10 to-day. Other stocks also showed advances.

On the San Francisco and Tonopah Exchange business was active, and a number of buying orders were reported. Montana Tonopah sold at $1.45@$1.50; Tonopah Belmont, 70c.; Tonopah Midway, 43c.; Rescue, 6c. per share.

On the California Exchange trading in oil stocks was rather light, but prices were steady. Caribou brought $1.70; Home, $1.15; Claremont, 70c.; Oil City, 31c. The heaviest trading was in Oil City and Claremont.

COAL TRADE REVIEW.

New York, Feb. 3.

ANTHRACITE.

The anthracite market continues on a weather basis. This means that retail buying is active all over the country, and that wholesale demand is somewhat strengthened. Generally speaking, however, the improvement in wholesale trade has not been as great as one might expect. The present winter is one of the most severe for 25 years. There have been two months of good coal-burning weather, and the tonnage consumed has been great, but the supplies laid in by all dealers last summer were so heavy that as yet the stock in dealers' hands, and in yards at distributing centers, are, though much diminished, still large enough to prevent any great increase in wholesale buying. There are still two months ahead of what promises to be coal-burning weather, and although the demand during March will naturally be restricted by the prospect of reduced prices on April 1, yet wholesale trade will probably be better during February than during January.

In the Northwest, the demand has improved considerably, owing to the extremely cold weather. Supplies at country yards have been greatly reduced, and the movement from the docks at the head of the lakes is very heavy, though delays in rail transportation, owing to poor car supply and weather conditions, have tended to restrict the movement. At Chicago the fact that Lake Michigan is now frozen across to the eastern shore indicates what the weather has been. Buying, however, has been chiefly at retail, the wholesale demand not being heavy. Snowstorms have greatly interfered with the movement of coal by rail west of Buffalo, and as a result receipts of all-rail coal at Chicago have been light. Along the lower lakes and in Canadian territory, as elsewhere, retail buying is brisk, while the distribution of coal to small country yards has been hampered by the weather. In the line trade farther east wholesale buying has been more active than in other territory, owing to the generally smaller supplies carried. In the Atlantic seaboard trade, demand at New York and Philadelphia reflects the weather conditions very accurately. At

Boston, owing to the large supplies laid in last fall, wholesale trade shows very little change, though, of course, retail buying is brisk. At New York the condition of the streets from ice and snow have made deliveries to consumers very difficult, while the movement of coal about the harbor has been hampered by floating ice. The demand for the small steam sizes is good.

BITUMINOUS.

The Atlantic seaboard bituminous trade continues quiet. The cold weather has improved buying, but the total increase in demand is slight. As regards next year's business we hear already of some small contracts being figured on, but these contracts are largely of a speculative nature, being based on mine prices with a proviso that any fall in the cost of mining shall accrue to the benefit of the purchaser. Terms named in such contracts of course do not represent trade conditions. The trade proper is waiting until the main line railroads name through rates for the coming year before making contracts.

In the far East the market is quiet, and demand is comparatively light; receipts of all-rail coal have temporarily disorganized conditions. Along Long Island sound the trade is taking a fair amount of coal in a quiet way, but demand is not active. At New York harbor points conditions are quiet, prices being $2.50@$2.60 for Clearfield grades f. o. b. New York harbor shipping port. All-rail trade is sluggish, though the usual tonnage is going forward.

Transportation from the mines to tidewater is fairly prompt, coal running through in less than a week. Car supply at the mines is up to all demands. Though the Chesapeake and Delaware bays are at present open, vessels are inclined to keep away from Philadelphia and Baltimore because of the danger of being caught by ice. Rates from New York harbor points are about as follows: Boston, Salem and Portland, 80@85c.; Providence, New Bedford and Long Island sound, 65@70c.

Birmingham. Feb. 1.

(From Our Special Correspondent.)

The coal production in Alabama is quite healthy. The indications are that the production during the month of February will be as good as it was in January. The past month saw no stoppages.

The work of development is still being pushed in this State. The Galloway Coal & Coke Co., operating mines in Walker county, will shortly have two new openings producing coal near Carbon hill. The mines are in the western part of Jefferson county on the North Alabama.

The reports being received by the State mine inspector, J. M. Gray, as to the coal production in Alabama last year (1903) are now being compiled, less than two dozen mines yet to report. The inspector has reports in hand accounting for 9,785,823 tons. Granting that the mines not reporting up to that date would make the same statement as to output as they did during 1902, the output for the year would go to 11,679,000 tons. It is the intention of inspector Gray to figure on the coal used in boilers and by the residents of the mining camps this year, as is done in other States, and this coal will be counted most likely at about 300,000 tons. This would bring the output for the State within a few tons of the 12,000,000 tons which was the estimate made three months ago. The production in 1902 amounted to 10,329,479 tons.

Chicago. Feb. 1.

(From Our Special Correspondent.)

There has been a decided stimulation of the market for both anthracite and bituminous coal in the last week, but the general condition of the market is, it must be confessed, still far from good. The severe cold of the week is telling on the bins of retailers and consumers of anthracite, and orders are increasing. But the fact remains that the Chicago territory laid in unusually large stocks before winter began, and no very great demand can be expected before spring. All-rail business is being well taken care of by the railroads, compared with previous winters, though there is still much complaint.

In the bituminous market the most active demand is for Indiana and Illinois and Hocking. Indiana lump brings $2@2.50; run-of-mine, $1.60@$2.10, and screenings, $1.10@$1.75. These prices apply also to Illinois. A movement to more general use of the higher-priced western coals is apparent. Hocking is popular at $3.50@$4. Smokeless is weak; run-of-mine brings $3.65, and prepared sizes and lump, $4.35. Delays in shipments are said to have held smokeless up to circular prices better than usually happens. Gas coals are still in light demand and heavy supply.

Cleveland. Feb. 2.

(From Our Special Correspondent.)

The steam coal trade in this territory is on a boom. The supply is short and the demand is rampant. The market is such that prices are not quibbled over. The call for steam coal has, perhaps, never been better in this city. The factories are beginning to start up again, needing their fuel, and other lines of trade also are consuming greater quantities. The prices have naturally appreciated. Pittsburg steam coal is selling at $1.40@$1.50, which is up from 15 to 25c. on the ton, at the mines. The call for slack is equally large. The market during the past week saw some rapid advances. The demand for slack has been so heavy that the prices have advanced from 50c. to $1.25 within three months. There is also a good demand for run-of-mine, or anything in the way of fine coal.

The lump coal situation is stronger and also more comfortable. Discretion dictated that many of the consumers lay in their winter supply, which they did. These have not suffered, but the others are finding a scarcity of both coal and fuel gas. The trains bearing that coal are on the way, but are held out by the storms. Domestic coal prices are based on $2.50 at the mines.

There is a good call for coke, but nothing out of the ordinary. The prices, however, are stiffening some, but have not shown a disposition to advance rapidly.

Pittsburg. Feb. 2.

(From Our Special Correspondent.)

Coal.—Trade is fairly good and prices are firm. All orders are for immediate shipment and no contracts of any importance has been made owing to the uncertainty as to the mining rate. The scale conference is now on at Indianapolis, and according to reports to-day both sides are far apart. The miners demand a straight run-of-mine basis in all states, a flat differential of 7c. between hand and machine-mined coal and a uniform scale for outside and inside labor. The operators propose the scale of 1902, which is equivalent to a reduction of about 12.5%. Despite the dangerous flood stage in the rivers fully 5,000,000 bu. of coal were shipped to the lower ports. The rivers are now filled with ice and shipment is impossible, but it is expected that another large shipment will be made, probably next week.

Connellsville Coke.—Production continues to increase, but prices are not improving. Furnace coke is selling at $1.50 a ton and less and foundry is now quoted at $2.10@$2.25. The production for the week according to the last report in the *Courier* was 173,511 tons, a gain of 8,623 tons compared with the previous week. The shipments for the week amounted to 8,005 cars distributed as follows: To Pittsburg and river tipples, 2,900 cars; to points west of Pittsburg, 3,645 cars; to points east of Everson, 1,460 cars.

San Francisco. Jan. 27.

(From Our Special Correspondent.)

The market has been quiet, with arrivals by water rather light. There is no change in prices.

Pacific coast coals in large lots to dealers are quoted as follows: Wellington and New Wellington, $8; Richmond, $7.50; Roslyn, $7; Seattle and Bryant, $6.50; Beaver Hill and Coos Bay, $5.50; white ash, $5.25. For Rocky mountain coals, ex-car, to dealers, prices are $14 for Colorado anthracite, $11.50 for Castle Gate, Clear Creek, Rock Springs and Sunnyside. Eastern coal is still nominal at $14 for Pennsylvania anthracite, and $13 for Cumberland, with very light stocks. Foreign coal in cargo lots is quoted at $13 for Welsh anthracite, $8.50 for cannel, $7.50 for Wallsend and Brymbo.

Foreign Coal Trade. Feb. 3.

Exports of coal and coke from the United States for the full year are reported as below by the Bureau of Statistics of the Department of Commerce and Labor:

	1902.	1903.		Changes.
Anthracite	907,977	2,008,857	I.	1,100,880
Bituminous	5,218,969	6,303,241	I.	1,084,272
Total coal	6,126,946	8,312,098	I.	2,185,152
Coke	392,491	416,385	I.	23,894
Totals	6,519,437	8,728,483	I.	2,209,046

Exports of coke were chiefly to Mexico. Exports of coal were distributed as follows:

	1902.	1903.		Changes.
Canada	4,468,593	6,5 5,863	I.	2,067,270
Mexico	537,708	846,412	I.	308,704
Cuba	377,484	439,764	I.	62,280
Other West Indies	392,504	220,496	D.	82,008
France	29,766	6,920	D.	22,846
Italy	86,530	49,220	D.	37,310
Other Europe	70,399	29,049	D.	41,350
Other countries	253,962	184,374	D.	69,588
Totals	6,126,946	8,312,098	I.	2,185,152

Of the anthracite exported last year 1,983,562 tons went to Canada and 18,476 tons to Cuba; only 6,819 tons going to all other countries.

Imports of coal into the United States for the year are reported as follows:

	1902.	1903.		Changes.
Canada	1,678,919	1,613,426	D.	65,493
Mexico	8,037	5	D.	8,032
Great Britain	529,190	1,321,862	I.	792,672
Other Europe	754	431	D.	323
Japan	9,556	61,466	I.	51,910
Australia	324,543	448,193	I.	123,650
Other countries	382	1,019	I.	637
Total	2,551,381	3,446,402	I.	895,021

Of the coal imported in 1903, there was 151,023 tons classed as anthracite, against 73,006 in 1902; the rest, in both years, was bituminous coal.

Messrs. Hull, Blyth & Co., of London and Cardiff, report, under date of January 23, that the coal market remains very firm. Quotations are: Best Welsh steam coal, $3.84; seconds, $3.78; thirds, $3.42; dry coals, $3.60; best Monmouthshire, $3.36; seconds, $3.36; best small steam coal, $2.04; seconds, $1.68; other sorts, $1.44. The above prices for Cardiff coal are all f. o. b. Cardiff, Penarth or Barry, while those for Monmouthshire descriptions are f. o. b. Newport, exclusive of the wharfage, but inclusive of export duty, and are for cash in 30 days, less 2½% discount.

The freight market is unchanged, prices for the most part being well maintained. Some rates from Cardiff are: Marseilles, $1.35; Genoa, $1.38; Naples, $1.26; Las Palmas, $1.32; St. Vincent, $1.50; Rio de Janeiro, $2.37; Santos, $2.52; Buenos Aires, $1.68.

IRON TRADE REVIEW.

New York, Feb. 3.

The iron trade continues in an unsatisfactory shape, buyers being apparently determined to stick to the waiting policy which they have pursued thus far with considerable effect. The foundry iron sales have been moderate and at some shading in prices. The only considerable buying reported is of No. 3 and 4 foundry by the cast-iron pipe people, who seem to have an exceptional run of orders. A rumor from Pittsburg of some heavy sales of iron for deliveries extending over a considerable period is noted, but it is impossible to obtain any confirmation of the reports.

In finished material but little is doing, and the market has been disturbed by reports of shading in billet prices. A few mills outside of the combination are apparently determined to obtain any business which they can, without particular reference to prices.

Negotiations for the sale of the Clairton Steel property to the United States Steel Corporation still continue, but nothing definite can be ascertained, though it is said the deal will probably be closed in a few days, if at all.

Exports and Imports.—Exports of iron and steel from the United States for the year 1903 were valued by the Bureau of Statistics of the Department of Commerce and Labor at $99,036,697, against $97,892,036 in 1902, and $102,534,575 in 1901. These figures include the value of machinery exported. The chief items

of iron and steel exports, in quantity, were as follows, in long tons:

	1902.	1903.		Changes.
Pig iron	27,487	20,381	D.	7,106
Billets and blooms	2,409	5,445	I.	3,036
Bars	31,549	37,183	I.	5,634
Rails	67,455	30,656	D.	36,799
Sheets and plates	18,300	18,024	D.	276
Structural	53,859	30,641	D.	23,218
Wire	97,844	108,532	I.	10,688
Nails	36,022	42,708	I.	6,686
Wire-rods	24,609	22,449	D.	2,160

Exports of iron ore in 1903 were 80,611 tons, against 88,445 tons in 1902; a decrease of 7,834 tons last year.

Imports of iron and steel for the year 1903 were valued at $41,253,333, against $41,468,826 in 1902, and $20,395,015 in 1901. The chief items of these imports were, in long tons:

	1902.	1903.		Changes.
Pig iron	625,383	599,574	D.	25,809
Scrap iron and steel	109,510	82,941	D.	27,759
Ingots, billets and blooms	289,318	261,559	D.	27,759
Bars	27,594	43,270	I.	15,674
Rails	63,522	95,555	I.	32,033
Wire-rods	21,382	20,836	D.	546
Tin-plates	60,115	47,360	D.	12,755

Imports of iron ore in 1903 were 980,440 tons, against 1,165,470 tons in 1902; a decreae of 185,030 tons.

Birmingham. Feb. 1.

(*From Our Special Correspondent.*)

The quietness which came on the Southern pig iron market immediately after the new year is still felt. Shipments during the past week were interfered with by the extremely cold weather, the heaviest fall of snow seen in several years being experienced last Thursday. Inasmuch as all the work in shipping iron is done on the outside and the loading entirely done by negroes, there was but little work obtained from the laborers during the time the snow was on the ground or the weather was very cold. The production of pig iron is holding up well, the stock-houses containing a good supply of raw material, so that slack work at the ore mines and limestone quarries is not disturbing the steady production of iron.

There has been no change in quotations, rumors to the contrary in the north notwithstanding. No. 2 foundry iron is quoted at $10 per ton.

The steel plant at Ensley, belonging to the Tennessee Coal, Iron & Railroad Co., is again making steel rails. An order for 5,000 tons from the Louisville & Nashville is in hand, and deliveries will be made in the immediate future. In finished iron and steel the Bessemer and Gate City rolling mills are working steadily. Nothing is heard concerning the big Birmingham mills.

The Alabama iron and steel circles were interested during the past week in the conferences between the presidents of the Sloss-Sheffield Steel & Iron Co., Republic Iron & Steel Co. and Tennessee Coal, Iron & Railroad Co. in New York City, the first object of which was to see what could be done to reorganize the old southern iron pool, and secondly to bring about a consolidation between the companies named. A conference is on in Birmingham between officials of the three companies interested looking to some action on the last named question. Mr. J. C. Maben, president of the Sloss-Sheffield Steel & Iron Co., returned to his office in Birmingham on Saturday, January 30, and he informed the correspondent of the ENGINEERING AND MINING JOURNAL that the pool had positively not been formed or reorganized. In regard to the consolidation of the concerns named he stated that it had been agreed that committees would be named who would ascertain the value of the three properties of each company, classed as ore and coal properties and mechanical plants. These committees will make an effort to equalize values, if possible.

Chicago. Feb. 1.

(*From Our Special Correspondent.*)

Though a month has passed since the beginning of a new year—the point when the local market for pig iron usually turns for better or worse—no decided change is yet manifest from the conditions of January 1. Orders are, however, gradually becoming placed for longer periods and large quantities; the change is very slow, however. There is a more optimistic feeling on the part of the trade than formerly, for the bottom point evidently has been reached and production is being restricted in some degree to the needs of the country. Probably 50,000 tons have been sold in the last week, against about 40,000 a month ago.

Southern continues the chief iron sold, No. 2 being $13.35@$13.85. Sales of Northern are, however, increasing, probably in greater ratio than sales of Southern. Northern brings about 50c. over Southern on corresponding grades.

Coke is weak; the market is filled with it, and all sorts of prices prevail, from $4.20 to $4.90, with 72-hour Connellsville holding up best.

Cleveland. Feb. 2.

(*From Our Special Correspondent.*)

Iron Ore.—The talk of a reduction in the prices of ore is now assuming proportions which warrant the belief that some action will be taken, when the time comes, looking to a material reduction of the existing prices. It is now admitted that a good part of the loss of business for 1903 grew out of the higher prices for ore, which confined the territory in which sales were made, to that which was aforetime tributary to the Lake Superior region. The new fields, which were opened about the beginning of 1902, were suddenly closed when the prices were advanced. The meeting of the Ore Association, at which prices will be fixed, has not been called.

New York. Feb. 3.

Pig Iron.—Some dealers report business as fair; other say the market is about as quiet as it has been. We quote as follows, for northern irons, good brands: No. 1 X foundry, $15.25@$15.50; No. 2 X, $14.75@$15; No. 2 plain can be had for 50c. less; while gray forge is selling around $13.75. For southern irons on dock quotations are: No. 1 foundry, $14.25; No. 2 foundry, $13.75, with lower grades in proportion. No. 1 soft can be had at about $14.25, and No. 2 soft at $13.75.

Bar Iron and Steel.—The market is still quiet. Refined bars are quoted at around 1.45c., in large lots, with steel at about the same. Common iron bars are as low as 1.30c.

Plates.—Buying is in small lots and demand shows no improvement. Sheared plates are quoted as follows: Tank, 1¼-in. and heavier, 1.76@1.80c.; flange, 1.95@2.05c.; marine, 2.10@2.15c.

Steel Rails.—The quotations remain $28 for standard sections, f. o. b. mills; light rails, $33@$36, according to weight.

Structural Material.—Large lots at tidewater are quoted at 1.75@2c. for beams, angles and channels.

Philadelphia. Feb. 3.

(*From Our Special Correspondent.*)

Pig Iron.—The downward tendency in crude iron continues. Authorities in the market have been asserting for some time past that the bottom limit had certainly been reached. The disorganized condition of the industry in northern Alabama accounts for much of the existing anarchy in prices. A great deal of business is still held up, although contracts were placed during the past few days for something over 200,000 tons of various kinds of pig iron. The starting of a new furnace at Cleveland, Ohio, has given the market another downward turn. The company owning this furnace has been soliciting business at cut rates and there is nothing for others to do but follow or go without the business. For certain qualities of forge iron which are very scarce, slightly higher prices have been paid for 500-ton lots. The market for No. 3 and No. 4 iron which is largely used for making cast pipe has slightly hardened in retail transactions. A good deal of southern iron is still being sold at $9.75 per ton. Northern furnaces are competing with some success for their share of this business.

Bars.—The bar iron trade is very quiet, business being still done on a basis of 1.25c. per pound.

Plates.—The demand for finished steel continues light because of the inactivity of the bridge builders who seem in no haste to place their usual winter requirements at this time.

Pipes and Tubes.—Several large consuming interests in this territory have been induced to send in orders for pipes and tubes which will cover their requirements up to the last of June.

Pittsburg. Feb. 2.

(*From Our Special Correspondent.*)

The pig iron market continues in very unsatisfactory shape, there being no demand at all for bessemer, and sales of other grades are limited to small lots for prompt delivery. Prices are easier than a week ago, but trade in this district seems to be dead. Some encouraging reports as to pig iron sales come from other districts, and a number of idle furnaces have been started during the week in the Pittsburg and surrounding districts. The last of the idle furnaces in the Edgar Thomson group of the Carnegie Steel Co. at Braddock was put in blast on Friday, and the Charlotte furnace at Scottdale, of Corrigan, McKinney & Co., of Cleveland, was started yesterday. This furnace was put out of blast some time ago with a large stock of iron in the yards, but the stock has entirely disappeared, and it is reported the firm has turned down several small orders for immediate shipment during the past few days. There has been a fair demand for malleable bessemer, and several inquiries have been received. Gray forge is still in good demand and firm at $13, Pittsburg. Several sales, aggregating about 1,000 tons, were made during the past few days. Foundry No. 2 is weaker, and it is believed that less than $13.50, Pittsburg, can be done. While the Valley furnaces continue to quote $13 at furnace for bessemer, it is rumored that this low rate can be shaded. Low phosphorus pig is advancing, as the United States Steel Corporation is out of the market. A sale of 1,000 tons at $19 is reported.

There is but little doing in steel, reports of shading in billet prices having disturbed the market somewhat. A leading member of the billet pool gave out a statement during the week that the pool price of $23 is being firmly maintained, and that the reported cut by the Ashland Steel Co., of Ashland, Ky., which is not a party to the agreement, should not have any effect on the market. There seems to be no doubt but that negotiations are on for the purchase by the United States Steel Corporation of the Clairton Steel Co. Despite an official denial made at the office of the Crucible Steel Co. of America, it seems to be the general opinion here that negotiations have progressed to such a stage that the deal will likely be closed this week. The cause of the delay is believed to be a failure to agree on a price. There is a slight improvement in some finished lines, notably wire products and merchant pipe. The wire mills are running steadily and have orders booked for fully two months ahead. Wire rods are firm at $30. There is a fair demand for plates, but some slight shading of prices is reported. Members of the plate pool are adhering strictly to the agreed price, the cutting being done by some outside interests, but is having no serious effect on the plate market. Steel bar prices are being firmly maintained, and the iron bar market is not weakening, but it is still possible to place orders at 1.30c., Pittsburg, or 1.25c., Youngstown. A fair number of inquiries are being received for structural material, and it is believed some large orders will be placed. A building boom is predicted for the Pittsburg district this year. This is based on the fact that all wage scales in the building line have been settled for the year. The Builders' Exchange League has won the fight against the Building Trades Council after a long lockout, and has enforced its demand that all wage scales terminate on December 31. Heretofore, one or more scales expired in every month in the year, and in 1903 strikes resulted in almost all trades. It is estimated that $5,000,000 worth of contracts were tied up last year by building trade disturbances. In every wage agreement is a clause that will prevent strikes. The tile layers and electricians were the last to come to terms. Both trades signed yesterday. The settlement

is expected to have a beneficial effect on the structural steel market.

Pig Iron.—Gray forge is firm at $13, Pittsburg, and about 1,000 tons were sold. No sales of bessemer have been recorded, and Valley furnaces continue to quote $13, Valley, but it is known that this price could be shaded. Foundry No. 2 is quoted at $13.60@$13.85, Pittsburg, but a small sale at $13.50 is reported. There is but little doing in foundry iron. According to reports, southern foundry iron is being firmly held at $10, Birmingham.

It is reported to-day that the Kittanning Iron & Steel Co. got a contract for 75,000 tons of foundry, the Cherry Valley Iron Co., 45,000, and M. A. Hanna & Co., 100,000 tons. The Lackawanna Iron & Steel Co. is reported to have bought 100,000 tons of bessemer pig iron. While the report of these sales cannot be confirmed, it is believed to be possible that inquiries have been or are about to be made for large lots of foundry and bessemer for delivery extending over a long period.

Steel.—Both bessemer and open-hearth billets are firm at $23, and sheet bars at $24. The reported cut by the Ashland interests has not apparently affected the market. Steel bars remain at 1.30c., and some new business is being booked. Plates continue at 1.60c.

Sheets.—A further weakness in the sheet market is noted. New orders are being received daily, but prices are not satisfactory. For black sheets, No. 28 gauge, 2.25c. can be done with less difficulty than a week ago. Galvanized sheets, No. 28 gauge, are quoted at 3.30@3.35c.

Ferro-manganese.—The market is weaker, and 80% domestic is quoted at $44@$45 per ton.

CHEMICALS AND MINERALS.

New York, Jan. 27.

Demand shows some improvement, especially where prices have eased off owing to the desire of sellers to clean up stocks. Transportation is still hampered by the stormy weather.

At last the Venezuela asphalt controversy, pending for about four years, and at one time threatening international complications, has been finally decided by the Federal High Court at Caracas. The decision makes null and void the claim of Warner & Quinlan, of Syracuse, N. Y., to the Felicidad mine in Bermudez, purchased in 1898, owing to the concession granted by the government some time previously to the New York & Bermudez Co. to work the Sucre asphalt beds.

With regard to the petition in involuntary bankruptcy filed last week by Franklin H. Kalbfleisch, it is stated that a large portion of the indebtedness was contracted by the old firm of Martin Kalbfleisch & Sons in 1886, and does not affect the existing business of the Franklin H. Kalbfleisch Co., now part of the General Chemical Co. Where claims have not been secured by notes and judgments, the petitioner pleads exemption from payment according to the statute of limitation.

Another semi-annual dividend of 3.50% will be paid March 1 by the Merrimac Chemical Co., of Boston, Mass.

Among the imports at New York in 1903 were 49,369 lb. bismuth, 940,662 lb. barium sulphate, 67,480 tons crude chalk, 642,616 lb. precipitated chalk, 15,139 tons china clay, 66,687 lb. cobalt oxide, 3,103 tons Fullers' earth, 637,184 lb. lithophone, 346,200 lb. mica, 8,062,051 lb. ocher, 979,829 lb. ozokerite, 3,765,083 lb. potassium carbonate, 198,432 lb. potassium permanganate, 1,793,876 lb. potassium prussiate, 112,154 lb. sodium hyposulphite, 298,886 lb. sodium nitrite, 5,239.448 lb. talc, 1,048,976 lb. ceresin and 1,396,310 lb. zinc oxide. Great Britain and Germany furnished the bulk of these imports.

Cyanide.—Quiet at 19@20c. per lb. f. o. b. New York.

Bleaching Powder.—The position of manufactures has been materially strengthened since the signing of the international trade agreement some months ago, but resellers who have accumulated stocks are obliged to sell at a substantial discount. Some of these sales have been made around $1 per 100 lb., which compares with the makers' quotations of $1.25 for prime British and American, and $1.20 for continental.

Copper Sulphate.—Apparently there is some speculation in this article, as makers have reduced their prices from $5.30 per 100 lb. to $5.10 at seaboard in a few days. Jobbers are understood to have sold at 5 to 10c. below these prices. It is interesting to note that the present is a propitious time for importers, even though they must pay a duty of 0.5c. per lb. Exporters catering to the Austrian market are given the tip to use hardwood instead of softwood barrels. The capacity should be about 550 lb. for convenience in handling. Hardwood barrels, when empty, can be sold at a profit, but soft wood can only be used for kindling wood.

Arsenic.—Demand continues good, and prices are firm at 3.10@3.125c. per lb., ex-store. It is estimated that the imports at Atlantic ports in January were approximately 224,000 lb. Spanish, 293,800 British, 33,165 lb. French, and 75,000 lb. from Germany and Belgium; a total of 625,965 lb.

Acids.—In certain directions contract deliveries have improved, but until the weather settles trade will continue to be of a hand-to-mouth character.

We quote as below per 100 lb., unless otherwise specified, for large lots in carboys or bulk (in tank cars), delivered in New York and vicinity:

Muriatic, 18°	$1.50	Oxalic, com'l	$5.00@$5.25
Muriatic, 20°	1.60	Sulphuric, 50°, bulk, ton	13.50@14.50
Muriatic, 22°	1.75	Sulphuric, 60°	1.05
Nitric, 36°	4.50	bulk, ton	18.00@20.00
Nitric, 38°	4.75	Sulphuric, 66°	1.20
Nitric, 40°	5.00	bulk, ton	21.00@23 00
Nitric, 42°	5.50		

Brimstone.—Occasional arrivals meet demand satisfactorily, so that prices change but little. Spot best unmixed seconds have sold at $22.375 @$22.625 per ton, while shipments are quoted at $22.25@$22.50. Best thirds are nominally 50c. less than seconds.

Pyrites.—Conditions are favorable for an increased consumption in the spring. The Clay county, Ala., pyrites deposits are being developed by the Grasselli Chemical Co., ostensibly to furnish sulphur for making acid to be used at the acid phosphate plant at Powderly, now being operated by the company.

We quote domestic pyrites $5 per ton for lump ore, f. o. b. Atlantic coast mines, and 10c. per unit for fines; sulphur content varies from 42@44%. Spanish pyrites, carrying from 46@52% sulphur, are quoted at 11@11.5c. per unit for lump, and 9.5@10c. for fines, delivered at Atlantic ports.

Nitrate of Soda.—Little change is noticeable in this market, quotations remaining at $2.15 per 100 lb. for spot, and $2.025@$2.10 for futures, according to position.

The Lagunas Nitrate Co., paying 8% last year, has passed the current interim dividend, in consequence of the recent purchase of new nitrate land in Chile.

Chilean Nitrate of Soda Market.—Messrs. Jackson Brothers, of Valparaiso, write under date of December 26 that although we have had a fair inquiry during the fortnight, producers have only offered a very limited quantity for prompt delivery, and have not been disposed to sell for next year at the prices offered. Sales have been effected of 95% for prompt at 7s. 6d.@7s. 3½d.; January-February, 7s. 2d. @7s. 2½d.; April-May, 6s. 9d.; April-December, 6s. 8½d.; October-December, 6s. 10d.; and in 96% for prompt at 7s. 4d., and April-May, 7s., all alongside terms. We quote 95% December, 7s. 3d.; January, 7s. 3d.; February, 7s. 2d.; March, 7s. 1d., and 96%, December-January, 7s. 5d.; all ordinary terms, sellers. The price of 7s. 3d., with an all-round freight of 15s., stands in 8s. 10d. per cwt., net cost and freight without purchasing. Sales reported for the fortnight were 257,000 qtl., and resales 220,000 qtl.

Sulphate of Ammonia.—Southern consumers are making better inquiries. Gas liquor is quoted at $3.20@$3.225 per 100 lb.

Phosphates.—Exporters of high-grade rock recognizing that their stocks are not likely to be as large again as they were a few years ago, when the trade was not so well regulated, are not pressing sales. Of course, an odd lot may be sold abroad for future delivery at a shade less than current quotations, but such transactions are rare.

Shipments of phosphates from Bone, Algeria, in the year 1903, are reported at 274,074 metric tons, of which the Constantine Co. furnished 169,190 tons, Societe Francaise des Phosphates de Tebessa, 28,959 tons, and the Dyr Co., 75,925 tons, principally to England, Germany and France. Compared with 1902 shipments there is an increase of 25,820 tons, or nearly 10.5%.

Current ocean freight rates are about as follows:

	Shipping-ports.		
	Florida.	So. Carolina.	Algeria.
Baltic	$3.60@$3.72	....	....
Continental	2.88@ 3.00	3.12	2.16
Mediterranean	3.36@ 3.60	....	....
United Kingdom	2.64@ 3.24	2.40@ 2.64	1.56@ 1.80

Prices for phosphates per ton are as follows:

Phosphates.	F. o. b.	C. i. f. Gt. Britain or Europe.
*Fla. hard rock, 77@80%	$6.50@$7.00	$11.12@$12.00
land pebble, 68@73%	3.75@ 4.00	7.70@ 8.05
†Tenn., 78@82%	4.00@ 4.25	10.80@ 11.40
78%	3.75@ 4.00	.....
75%	3.25@ 3.50	.....
73@74%	2.95@ 3.20	.....
‡So. Car. land rock	3.25	.....
river rock	2.75@ 3.00	5.75@ 6.88
Algerian 63@70%	.....	.....
58@63%	.....	6.00@ 6.60
53@58%	.....	4.95@ 5.09
Tunis (Gafsa)	.....	6.15@ 6.60
Christmas Isle, 80@85%	.....	12.38@ 13.61
Ocean Isle, 82@88%	.....	13.39@ 14.45
Somme, Fr., 70@75%	.....	10.15@ 10.33
Bordeaux, Fr., 60@65%	.....	7.50@ 7.66
55@60%	.....	6.33@ 6.47
Liege, Bel., 60@65%	.....	6.88@ 7.03

*F. o. b. Florida or Georgia ports. †F. o. b. Mt. Pleasant. ‡On vessel, Ashley River, S. C.

Liverpool. Jan. 20.

(Special Report of Joseph P. Brunner & Co.)

Sulphate of copper is still the only article that seems to attract any special attention, and inquiries are in the market this week from America. Nearest spot quotations are £21 2s. 6d.@£21 5s. per ton, while for February and spring delivery £21 7s. 6d.@£21 10s. per ton is quoted, all f. o. b. here, less 5%.

Soda ash is firm. For tierces, nearest range for any position is about as follows: Leblanc ash, 48%, £5@£5 10s.; 58%, £5 10s.@£6 per ton, net cash. Ammonia ash, 48%, £4 5s.@ £4 10s.; 58%, £4 10s.@£4 15s. net cash. Bags, 5s. per ton under price for tierces. Soda crystals are in moderate demand at generally £3 7s. 6d. per ton, less 5% for barrels, or 7s. less for bags, with special terms for a few favored markets. Caustic soda is quiet, but prices are maintained as follows: 60%, £8 15s.; 70%, £9 15s.; 74%, £10 5s.; 76%, £10 10s. per ton, net cash. Special quotations for the Continent and a few other export quarters.

Bleaching powder is quoted at £4 5s.@£4 10s. per ton, net cash, for hardwood, as to market, but there is still little moving.

Chlorate of potash is neglected, and prices are nominal at 2⅜@2½d. per lb., net cash, for English make.

Sulphate of ammonia is quiet at £13 2s. 6d. @£13 5s. per ton, less 2½% for good gray 24@25% in double bags f. o. b. here.

Nitrate of soda is fairly steady on spot at £10 per ton, less 2½% for ordinary, up to £10 5s. per ton, less 2½% for best refined, in double bags f. o. b. here. Refined is still scarce.

METAL MARKET.

New York, Feb. 3.

Gold and Silver Exports and Imports,

At all United States Ports in December and Year.

Metal	December.		Year.	
	1902.	1903.	1902.	1903.
Gold:				
Exports.	$2,853,112	$1,404,656	$36,030,591	$44,346,834
Imports.	2,186,638	17,230,298	44,193,317	65,267,696
Excess	E. $666,476	I. $15,765,642	I. $8,162,726	I. $20,920,862
Silver:				
Exports.	5,546,875	5,079,244	49,272,954	39,189,933
Imports.	2,701,286	2,078,655	26,402,935	23,974,508
Excess	E. $2,845,589	E. $3,000,589	E. $22,870,019	E. $15,224,425

These exports and imports cover the totals from all United States ports. The figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Exports and Imports, New York.

For the week ending January 30 and for years from January 1

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week	$233,850	$36,698	$952,446	$14,704
1904	473,634	1,150,084	4,318,063	68,404
1903	26,120	598,0 0	1,329,673	108,340
1902	1,954,495	72,003	3,872,371	107,917

The figures for the current year include shipments too late for last week's summary.

General business continues in a fair condition only. Readjustment in several lines requires time for its completion. Some recovery is reported in the speculative markets.

The Treasury Department's estimate of the money in the United States on February 1 is as follows:

	Total.	In Treasury Feb. 1, 1904.	In Circulation.
Gold coin (inc. bul. in Tr'y	$1,326,841,555	$229,362,091	$627,905,855
Gold ctfs.	.....	.....	469,573,609
Silver dollars	555,449,127	21,549,699	77,963,600
Silver ctfs.	.....	.....	455,935,828
Subsidiary silver	105,903.449	10,433,124	95,470,325
Tr'y notes 1890	15,322,000	88,327	15,233,673
U. S. notes	346,681,016	8,988,196	337,692,820
Cur. ctfs.	.....	.....	.....
Nat. Bk. Nts.	426,857,627	18,654,036	408,203,591
Total	$2,777,054,774	$289,075,473	$2,487,979.301

Population of the United States, February 1, 1904, estimated at 81,292,000; circulation per capita, $30.61. For redemption of outstanding certificates an exact equivalent in amount of the appropriate kinds of money is held in the Treasury, and is not included in the account of money held as assets of the Government. This statement of money held in the Treasury as assets of the Government does not include deposits of public money in national bank depositaries, to the credit of the Treasurer of the United States, and amounting to $158,855,032. The total amount in circulation shows an increase of $21,633,404 over January 1; and of $132,240,467 over February 1, 1903.

The statement of the New York banks—including the 56 banks represented in the Clearing House—for the week ending January 30 gives the following totals, comparison being made with the corresponding week of 1903:

	1903.	1904.
Loans and deposits	$904,510,700	$904,552,100
Deposits	931,773,900	1,023,943,800
Circulation	45,184,900	42,739,000
Specie	182,672,000	205,477,500
Legal tenders	78,153,500	75,637,500
Total reserve	$260,825,500	$281,115,000
Legal requirements	232,944,725	255,985,950
Balance surplus	$27,880,775	$25,129,050

Changes for the week were increases of $29,487,200 in loans and discounts, $37,640,500 in deposits, and $10,269,600 in specie; decreases of $402,200 in circulation, and $943,625 in surplus reserve.

The following table shows the specie holdings of the leading banks of the world at the latest dates covered by their reports. The amounts are reduced to dollars and comparison is made with the holdings at the corresponding date last year:

	1903.		1904.	
	Gold.	Silver.	Gold.	Silver.
N. Y. Ass'd	$182,672,000	.....	$205,477,500	.....
England	171,913,790	.....	170,930,630	.....
France	502,361,465	$218,892,205	469,027,700	$220,814,445
Germany	164,940,000	57,955,000	170,765,000	60,000,000
Spain	72,045,000	99,435,000	72,850,000	95,735,000
Netherlands	23,491,500	33,177,500	25,089,500	32,712,500
Belgium	16,113,335	8,056,665	16,043,335	8,021,665
Italy	84,660,000	13,400,000	109,480,000	16,550,000
Russia	381,615,000	34,365,000	430,250,000	36,565,000
Austria	231.645,000	63,175,000	233,160,000	62,260,000

The returns of the Associated Banks of New York are of date of January 30, and the others January 28, as reported by the *Commercial and Financial Chronicle* cable. The New York banks do not report silver separately, but specie carried is chiefly gold. The Bank of England reports gold only.

The silver market has shown very little disposition to rise, owing to uncertainty about Indian purchases. To-day's information, to the effect that the silver reserves in the Indian Treasury were increasing, weakened the London market, and the price receded to 25⅝d.

The United States Assay Officer in New York reports receipts of 30,000 oz. silver for the week.

Shipments of silver from London to the East for the year up to January 21 are reported by Messrs. Pixley & Abell's circular as follows:

	1903.	1904.		Changes.
India	£693,200	£1,064,289	I.	£371,089
China	5,000	.....	D.	5,000
Straits	42,982	38,103	D.	4,879
Total	£741,182	£1,102,392	I.	£361,210

Receipts for the week were £182,000 in bar silver from New York and £4,000 from Australia; total, £186,000. Shipments were £473,200 in bar silver, and £26,300 in Mexican dollars to Bombay; total £499,500.

Indian exchange continues strong, owing to the demand for money in the presidencies, and the general activity of trade. The Council bills offered in London sold at an average of 16.09d. per rupee. The buying of silver for private account in India continues very fair.

The coinage of the United States mints in January is reported by the Bureau of the Mint, Treasury Department, as below:

Denomination.	Pieces.	Value.
Double eagles	114,000	$2,280,000
Half-eagles	97,000	485,000
Total gold	211,000	$2,765,000
Dollars	4,452.000	4,452,000
Quarter-dollars	512,000	128,000
Dimes	770,000	77,000
Total silver	5,734,000	$4,657,000
Five c., nickel	971,000	48,550
One c., bronze	4,823,000	48,230
Total minor	5,794,000	$96,780
Total coinage	11,739,000	$7,518,780

In addition there was coined 500,000 2-bolivar pieces for Venezuela.

Prices of Foreign Coins.

	Bid.	Asked
Mexican dollars	$0.42½	$0.45
Peruvian soles and Chinese pesos	.41	.44
Victoria sovereigns	4.85⅛	4.87
Twenty francs	3.85	3.87
Spanish 25 pesetas	4.78	4.82

OTHER METALS.

Daily Prices of Metals in New York.

Jan.-Feb.	Silver N. Y. Cts.	Silver London, Pence.	Copper Lake, Cts. per lb.	Copper Electrolytic, Cts. per lb.	Copper London, £ per ton.	Tin, Cts. per lb.	Lead, Cts. per lb.	Spelter N. Y., Cts. per lb.	Spelter St. Louis, Cts. per lb.
28	55⅛	25 5/16	12¼ @12⅜	12⅜ @12⅝	56¼	28¼	4.45 @4 50	4.85	4.65
29	55⅜	25¾	12¼ @12⅜	12⅜ @12⅝	56⅝	28⅛	4.35 @4.40	4.85	4.65
30	55⅝	25¾	12¼ @12⅜	12⅜ @12⅝	....	28⅛	4.35 @4.40	4.85	4.65
1	56⅛	26	12 @12⅛	12 @12¼	56¼	28¼	4.35 @4.40	4.85	4.65
2	56¼	26 1/16	12 @12⅛	12 @12¼	56⅛	28 27⅞ @ 28	4.35 @4.40	4.85	4.65
3	55⅝	25⅞	12 @12¼	12 @12¼	56¼	23	4.35 @4 40	4.85	4.65

London quotations are per long ton (2,240 lbs.) standard copper, which is now the equivalent of the former g. m. b's. The New York quotations for electrolytic copper are for cakes, ingots or wire-bars: the price of electrolytic cathodes is usually 0.25c. lower than these figures

QUOTATIONS ON STERLING EXCHANGE.

January 28	4.85⅝	February 1	4.85¼
" 29	4.85⅛	" 2	4.85⅛
" 30	4.85⅛	" 3	4.85⅛

Copper. — Dullness has reigned supreme throughout the week, and the market has been devoid of any special feature. There has been some pressure to sell on the part of leading producers, which found expression in lower prices being named in Europe, but consumers over there seem to be fully supplied at the moment, the exports for the month of January having reached the record figure of 29,000 tons. On this side manufacturers still remain rather apathetic, although it is conceded that with most of them stocks are at low ebb and more active business may be looked for in the near future. Under the circumstances, quotations are more or less nominal at 12@12½c. for Lake; 12@12¼c. for electrolytic copper in ingots, cakes and wirebars; 11¾@12c. in cathodes; 11¾@12c. for casting copper.

The market for standard copper in London, which closed last week at £56 7s. 6d., opened on Monday at £56 5s., advanced on Tuesday to £56 10s., and the closing quotations on Wednesday are cabled as £56 5s.@£56 7s. 6d. for spot, £55 15s.@£55 17s. 6d. for three months.

Statistics for the second half of January show an increase in the visible supplies of 1,100 tons.

Refined and manufactured sorts we quote: English tough, £60@£61; best selected, £61@£62; strong sheets, £70@£71; India sheets, £67@£68; yellow metal, 6¼@6⅝d.

Exports of copper from New York, Philadelphia and Baltimore in the week ending February 2 were 8,141 tons, making 39,086 tons since January 1. Of this total 12,145 tons went to Germany and Holland; 5,191 tons to Great Britain, in addition to 42 tons matte; and 8,550 tons copper to France; the balance going to various other countries. Imports for the week were 680 tons copper from Mexico. Since January 1 receipts have been 2,404 tons, chiefly from Mexico and Great Britain.

Imports of copper and copper material into the United States for the calendar year, with re-exports of foreign copper, are reported by the Bureau of Statistics of the Department of Commerce and Labor as below, the figures given here being in long tons:

Copper:	1902.	1903.		Changes.
Imports	46,040	61,030	I.	14,990
Re-exports	5,192	934	D.	4,258
Net imports	40,848	60,096	I.	19,248
Ores and Matte:				
Imports	181,566	284,911	I.	103,345
Re-exports	14,446	5,150	D.	9,296
Net imports	167,120	279,761	I.	112,641

The reports do not separate ore and matte, so that it is difficult to get at the exact contents in copper. Estimating these as closely as possible, it appears that the net imports of copper in all forms in 1903 approximated 71,024 long tons. The Bureau of Statistics has recently begun to give the copper contents of ores and matte imported, but this statement does not cover the whole year.

Of the imports of copper in 1903 the larger part were from Mexico. These imports were made up as follows:

	Tons.	Per ct.
Mexico	39,893	65.4
Canada	7,110	11.6
Japan	1,609	2.6
Europe	10,070	16.5
Cuba and West Indies	350	0.6
Other countries	1,998	3.3
Totals	61,030	100.0

Of the imports of ore and matte 243,918 tons were from Canada, 39,261 tons from Mexico, 1,732 tons from other countries. The Canadian imports were chiefly ores, and the Mexican, matte.

Exports of domestic copper and copper material for the year are reported as below, in long tons:

	1902.	1903.	Changes.
Copper	158,334	138,719	D. 19,615
Ores and matte	18,035	12,291	D. 5,744

The ores and matte are not separated, so that the contents cannot be closely ascertained. Estimating them, chiefly on the basis of values, we find the total exports of copper to have been approximately 142,739 tons.

The December exports of copper last year were very heavy, being 17,290 long tons, against 8,314 tons in December, 1902.

Tin has ruled dull throughout the week, and nothing of interest has transpired. The closing quotations are given as 27⅞@28c. for spot and futures.

The foreign market, which closed last week at £126 7s. 6d., opened on Monday at £125 17s. 6d., advanced on Tuesday to £126, and the closing quotations on Wednesday are cabled as £126 2d. 6d.@126 5s. for spot, £126@£126 2s. 6d for three months.

Statistics for the month of January show an increase in the visible supplies of 2,100 tons.

Imports of tin into the United States for the calendar year are reported as below; the figures given are in long tons:

	1902.	1903.	Changes.	
Straits	19,855	18,639	D.	1,216
Australia	263	257	D.	6
Great Britain	15,581	16,709	I.	1,128
Holland	1,621	1,057	D.	564
Other Europe	570	384	D.	186
Other countries	76	68	D.	8
Totals	37,966	37,114	D.	852

The tin imported through Great Britain is chiefly Straits tin, while that from Holland is Banka and Billiton tin.

Lead.—The feature of the week has been a reduction in the prices quoted by the American Smelting & Refining Company of $2 per ton, which took place last Friday. The closing quotations are given as 4.35@4.40, New York; 4.30@4.32½, St. Louis.

The foreign market is again easier, Spanish lead being quoted at £11 2s. 6d.@£11 5s.; English lead, £11 5s.@£11 7s. 6d.

Imports of lead into the United States in all forms, with re-exports of foreign lead, for the calendar year, are reported by the Bureau of Statistics as below, in short tons:

	1902.	1903.	Changes.	
Lead, metallic	2,529	3,023	I.	494
Lead in ores and base bullion	105,186	103,384	D.	1,802
Total imports	107,715	106,407	D.	1,308
Re-exports	78,967	81,915	I.	2,948
Balance	28,748	24,492	D.	4,256

The balance is not consumed here, but is chiefly held in bond. Of the imports in 1903, there were 93,068 tons from Mexico and 9,600 tons from Canada. In addition to the re-exports, 56 tons of domestic lead were exported in 1903, against 3,271 tons in 1902.

Spelter.—On account of the cold weather prevailing, mining operations in the Joplin district have been interfered with to some extent. However, in the absence of any large consumptive inquiries the market has remained quiet at last week's figures, 4.65 St. Louis, 4.85 New York.

The foreign market remains strong, good ordinaries being quoted at £21 17s. 6d.@£22; specials, £22 2s. 6d.@£22 5s.

Exports of spelter from the United States in 1903 were 1,521 short tons, against 3,237 tons in 1902; a decrease of 1,716 tons. Exports of zinc ore were 35,188 tons, against 49,762 tons in 1902; a decrease of 14,574 tons.

Antimony.—The market is somewhat firmer in tone, owing to the fact that it is expected that in the case of war between Russia and Japan, shipments from the latter country will be interfered with. The closing quotations are given as 7@7½ for Cookson's; 6½@6¾ for Hallett's; 5¾@5⅞ for U. S., Japanese, Italian, French, Hungarian and Chinese.

Imports of antimony into the United States for the calendar year are reported as follows, in pounds:

	1902.	1903.	Changes.	
Metal and regulars	5,742,703	5,125,515	D	617,188
Antimony ore	1,639,043	2,673,142	I	1,034,099

This shows a decrease of 10.7% in metal and regulus, but an increase of 63.1% in ore imported.

Nickel.—The price is quoted by leading producers at 40@47c. per lb. for large quantities down to ton lots, according to size and terms of order. The price for smaller lots, according to quantity, runs as high as 60c. per lb.

Exports of nickel, nickel oxide and nickel matte from the United States for the year 1903 were 2,414,499 lb., against 3,228,607 lb. in 1902; showing a decrease of 814,108 lb. last year.

Platinum.—Demand continues steady, and the price is easier at $18.50 per oz.

Messrs. Eimer & Amend, of New York, quote prices for platinum in manufactured forms, as follows: Heavy sheet and rod, 72c. per gram; foil and wire, 75c. per gram; platinum crucibles and dishes, 77c. per gram; perforated wire, like cones, Gooch crucibles, etc., 82c. per gram.

Imports of platinum into the United States for the year 1903 were 7,852 lb., against 7,231 lb. in 1902; an increase of 621 lb. last year.

Quicksilver.—The New York price is $45.50 per flask for large lots, while a slightly higher figure is quoted for smaller orders. The San Francisco quotations continue at $44@$45 per flask for domestic orders and about $41.50 for export. The London price is £8 5s. per flask, with the same quotation asked by second hands.

Exports of quicksilver from the United States in 1903 were 1,344,615 lb., against 1,013,434 lb. in 1902; an increase of 331,181 lb. last year.

Cadmium.—According to Herr Paul Speier metallic cadmium was in good demand throughout 1903. Metal containing 99.5 per cent. cadmium sold at from 675 to 700 marks per 100 kg., delivered in Berlin.

Minor Metals and Alloys.—Wholesale prices, f. o. b. works, are as follows:

Aluminum	Per lb		Per lb
No. 1. 99% ingots	33@37c.	Ferro-Tungsten (37%)	38c.
No. 2. 90% ingots	31@34c.	Magnesium, pure (N. Y.)	60c.
Rolled Sheets	4c. up	Manganese	$2.75
Alum-bronze	20@23c.	Mangan'e Cop. (20% Mn)	32c.
Nickel-alum	33@36c.	Mangan'e Cop. (30% Mn)	38c.
Bismuth	$2.10	Molybdenum (Best)	$2.00
Chromium, pure (N. Y.)	80c.	Phosphorus, foreign	45c.
Copper, red oxide	50c.	Phosphorus, American	70c.
Ferro-Molybde'm (50%)	$1.25	Sodium metal	50c.
Ferro-Titanium (10%)	90c.	Tungsten (Best)	88c.
Ferro-Titanium (20@25% N. Y.	55c.		

Variations in price depend chiefly on size of order. Advances in molybdenum and tungsten have been made recently.

Missouri Ore Market. Jan. 30.

(From Our Special Correspondent.)

The high price of zinc passed back up to $38 per ton for the week, the assay basis price remaining unchanged at $31@$34 per ton of 60% zinc. A week of alternate blizzards and warm waves has been upon the district, and it has resulted in an estimated falling off in the output of the week of fully one-third the usual production. This, coupled with the fact of increased sales, reduces the reserve stock about 1,000 tons, leaving the stock a little above 5,000 tons. The stock seldom falls below that figure, but whenever it does there is apparent an uneasiness among the purchasing agents. So long as each one is willing to take a proportionate share all goes smoothly and well, but should one or more take a notion to buy more than a proportionate share, the price readily rises, and there is often a hasty scramble for the larger share. The week began cold and ends cold, with the promise from the weather bureau that it will be pretty rough for at least another week.

Lead is not in demand at such fancy prices as the previous week. The Granby Mining & Smelting Co. succeeded in getting a recognized position in the field as a purchaser, and the buyer is dropping back to meet the prices of other buyers. The price for the week was $57.50 per ton, with especially choice grades selling at $58.50 per ton. The cold weather is affecting the output of lead, creating a decided shortage, and, even with the metal market looking weaker, it is not believed that prices will be much, if any, lower here for some time.

Following are the shipments of concentrates from the various camps of the district for the week:

	Zinc lb.	Lead lb.	Value.
Joplin	2,631,300	202,650	$50,555
Webb City-Carterville	1,814,850	286,700	36,300
Duenweg	1,017,560	52,900	18,300
Alba-Neck	740,160	.....	12,950
Galena-Empire	475,200	60,640	9,100
Aurora	345,720	9,130	5,785
Oronogo	279,660	12,280	4,935
Granby	248,500	41,500	4,300
Badger	186,190	.....	2,980
Carthage	163,910	.....	2,785
Prosperity	144,440	4,710	2,443
Spurgeon	108,460	56,460	2,370
Cave Springs	125,050	1,120	2,100
Zincite	89,850	5,030	1,630
Mitchell	58,860	20,180	1,520
Reeds	60,930	.....	915
Central City	22,060	6,520	500
Totals	8,512,700	759,820	$159,470
Five weeks	43,956,510	5,805,920	865,500

Zinc value, the week, $137,705; five weeks, $707,600.
Lead value, the week, 21,765; five weeks, 157,900.

Average Prices of Metals per lb., New York.

Mo.	Tin.		Lead.		Spelter.	
	1903	1904.	1903.	1904.	1903.	1904.
Jan...	28.33	28.845	4.075	4.347	4.865	4.863
Feb..	29.43	....	4.075	.....	5.043	....
Mar..	30.15	.....	4.442	.....	5.349	....
April.	29.81	.....	4.567	.....	5.550	....
May .	29.51	.....	4.325	.....	5.639	....
June .	28.34	.....	4.210	.....	5.697	....
July..	27.68	.....	4.075	.....	5.662	....
Aug..	28.29	.....	4.075	.....	5.725	....
Sept..	28.77	....	4.243	.....	5.686	....
Oct...	25.92	.....	4.375	.....	5.510	....
Nov..	25.42	.....	4.218	.....	5.388	....
Dec...	27.41	.....	4.162	.....	4.731	....
Year	28.09	.....	4.237	.....	5.400	....

NOTE.—The average price of spelter in St. Louis for the month of January, 1904, was 4.673c. per lb.

Average Prices of Copper.

Mo.	New York.				London.	
	Electrolytic.		Lake.		Standard.	
	1903.	1904.	1903.	1904.	1903.	1904.
Jan...	12.159	12.410	12.361	12.553	53.52	57.55
Feb...	12.778	.....	12.901	.....	57.34	.....
Mar..	14.416	.....	14.572	.....	63 85	.....
April.	14.454	.....	14.642	.....	61.72	.....
May..	14.435	.....	14.618	.....	61.73	.....
June .	13.942	.....	14.212	.....	57.30	.....
July..	13 094	.....	13.341	.....	58.64	.....
Aug..	12.962	.....	13.159	.....	58.44	.....
Sept..	13.205	.....	13.345	.....	56.82	.....
Oct...	12.801	.....	12.954	.....	55 60	.....
Nov..	12.617	.....	12.813	.....	56.30	.....
Dec. .	11.952	.....	12,084	.....	56.36	.....
Year	13.235	.....	13.417	.....	57.97	.....

New York prices are in cents, per pound; London prices in pounds sterling, per long ton of 2,240 lbs., standard copper. The prices for electrolytic copper are for cakes, ingots or wire bars; prices of cathodes are usually 0.25 cent lower.

Average Prices of Silver, per ounce Troy.

Mo.	1902.		1903.		1904.	
	London. Pence.	N. Y., Cents.	London Pence.	N. Y., Cents.	London, Pence.	N. Y., Cents.
Jan..	25.62	55.56	21.98	45.57	26 423	57.055
Feb..	25.41	55.09	22.11	47.89	.....	.....
Mar..	25.00	54.23	22.49	48.72	.....	.....
April.	24.34	52.72	23.38	50.56	.....	.....
May..	23.71	51.31	24.89	54.11	.....	.....
June .	24.17	52.30	24.29	52.86	.....	.....
July..	24.38	52.88	24.86	53.92	.....	.....
Aug..	24.23	52.52	25.63	55.36	.....	.....
Sept..	23.88	51.52	26.75	58.00	.....	.....
Oct...	23.40	50.57	27.89	60.36	.....	.....
Nov..	22.70	49.07	27.01	58.11	.....	.....
Dec...	22.21	48.03	25.73	55.375	.....	.....
Year	24.09	52.16	24.75	53.45	.....	.....

The New York prices are per fine ounce; the London quotation is per standard ounce, .925 fine.

DIVIDENDS.

Company.	Latest Payable.	Dividend. Rate.	Dividend. Total.	Total to date.
†Amalgamated Copper	Feb. 29	$0.50	$769,430	$23,503,837
Cambria Steel	Feb. 15	.75	675,000	7,125,000
†Camp Bird, Colo.	Feb. 6	.18	240,000	1,115,304
Jeff. & Clear. C.&I., p.	Feb. 15	2.50	37,500	637,500
†Nat'l Carbon, pf.	Feb. 16	1.75	78,750	1,653,750
New Central Coal, Md.	Mar. 1	.40	20,000	270,000
New Cen. Zinc, extra.	Mar. 1	.00½	750	....
New Century Zinc, Mo.	Feb. 1	.01	1,500	2,250
Northern Light, Utah.	Feb. 1	.05	20,000	20,000
Ophir, Nev.	Jan. 27	.25	25,200	1,621,000
Quincy Copper	Feb. 25	2.50	250,000	14,370,000
†U. S. Steel Corp., pf.	Feb. 15	1.75	3,614,417	96,491,603

* Monthly. † Quarterly. ‡ Semi-annually.

ASSESSMENTS.

Company	Delinquent.	Sale.	Amount.
Andes, Nev.	Feb. 12	Mar. 4	.10
Bullion, Nev.	Feb. 18	Mar. 8	.05
Challenge Con., Nev.	Feb. 24	Mar. 16	.10
Eagle, Utah	Feb. 24	Mar. 17	.00½
Gould & Curry, Nev.	Feb. 8	Feb. 26	.10
Grape Vine Canyon, Cal.	.....	.....	.05
Honerine, Utah	Feb. 18	.....	.10
Manhattan, Utah	Feb. 6	Feb. 27	.00¼
Oswego, Cal.	Feb. 10	.....	.02
Shenandoah, Nev.	Feb. 15	.....	.02
Sumdum, Alaska	Feb. 23	.....	.10
Tonopah-Monarch, Nev.	Feb. 12	.....	.01

STOCK QUOTATIONS

NEW YORK.

Company.	Par val.	Jan. 27 H.	Jan. 27 L.	Jan. 28 H.	Jan. 28 L.	Jan. 29 H.	Jan. 29 L.	Jan. 30 H.	Jan. 30 L.	Feb. 1 H.	Feb. 1 L.	Feb. 2 H.	Feb. 2 L.	Sales.
Acacia						10								
Amalgamated, c..	100	51⅛	50⅛	50⅛	48⅛	49⅛	48⅛	48⅝	47⅛	50¾	47⅛	51⅝	49⅛	318,720
Anaconda, c.	25	74				73	72			72		74	67	4,150
Anaconda, g.	5													
Andes, s.	7													
Belcher, s.	3			38	37							1.85		600
Best & Belcher, s..	25											06½	06	100
Brunswick, g	5			06		06				06				5,000
Bullion, s.	1					09								500
Caledonia, s.	1			95		95				95	93			700
Chollar, s., g.	2½													
Confidence	3													
Con.Cal.&Va., g.s.	2½	1.15		1.65		1.75	1.70	1.60		1.65		1.60		1,000
Con. Imperial, s..	1	04½	04			05				04½				2,500
Cripple Creek, g..	1			08				08		09				2,500
Crown Point	2½	25		30								30		1,500
Daly, g. s.	20			2.00										50
Elkton, g.	1			61		55				60				700
El Paso, g.	1													
Gold Dollar, g.														
Gould & Curry	1													
Greene Con., c.	10	12⅛	11¾	12⅛	12¼	12⅛	12¼	12⅝	12⅜	12⅛	11	11⅛	11¼	15,458
Hale & Norcross..	3	74		75	74									700
Homestake, g.	100													
Horn Silver	20	1.25		1.22		1.25				1.25				800
Isabella, g.	1			14										500
Julia, s.	1	06												500
Justice, s.	2	10												200
Leadville, s. l	10													
Little Chief, g. s.	50													
Mexican, s.	3	1.75										1.60		200
Mollie Gibson, g.	5													
Moon Anchor, g.	5													
Occidental, s.	3													
Ontario, s. l	100							4.50						40
Ophir, s.	3			3.60		3.85	3.80	3.75	3.70			3.75		900
Overman, s.	2					34								200
Pharmacist, g.	1	05½		04		04								2,500
Phœnix, g.	1	12	10			12		12½	12	12		12	11	5,100
Portland, g.	1			1.60				1.60						200
Potosi, s.	1			22	21							23	22	900
Quicksilver, Pf.	100							5.25						50
Savage, s.	3							55						50
Sierra Nevada, s..	3	65				65						63		800
Silver Hill, g. s.	1							74	73	73				600
Small Hopes, g. s.	20													
StandardCon.,g.s.	10			2.00		2.00								150
Tenn., c.	25													
Union Con., g. s.	1	78								89				300
Union Copper	25	¾				⅞	¾					¾		1,600
United, com., c.	100													
Utah, s.	1													
White Knob, c.	10	7⅝	6½	7½	7	7								1,010
Work	1							04½		07½				1,000
Yellow Jacket, s.	3											50	49	300

c—Copper. g—Gold. l—Lead. s—Silver. Total sales, 372,078 shares. † Ex-dividend.

BOSTON, MASS.

Company.	Par val	Jan. 27 H.	Jan. 27 L.	Jan. 28 H.	Jan. 28 L.	Jan. 29 H.	Jan. 29 L.	Jan. 30 H.	Jan. 30 L.	Feb. 1 H.	Feb. 1 L.	Feb. 2 H.	Feb. 2 L.	Sales.
AdventureCon., c	$25	2⅞	2½	2⅞	2½	2⅞	2⅞	2⅝		2⅞	2	2½		753
Aetna q.	5													
Allouez, c.	25	4¾	4½	4½		4½		4⅜		4⅜		4¼		1,475
Amalgamated, c.	100	51	50¼	50¼	48⅜	49⅛	48	48¼	47⅞	50⅝	47⅜	53	49¼	45,743
Am. Gold Dredg.	5													
Am. Z., L. & Sm.	25	10												80
Anaconda, c. s.	25	19		19										175
Arcadian, c.	25	90		85	80	80		75		72½	52½	50	25	1,570
Arnold, c.	25													
Atlantic, c.	25			8										35
Bingham Con.	50			23	22½	22½	22¼	22½	22	22½		22¾	22	1,105
Bonanza Dev. g.	10													
British Col., c.	5													
Calumet & Hecla	25			455		450					450	460	450	52
Centennial, c	25	16	15½	16	15½	15⅝	15½	15⅝	15⅝	16¼	15¼	16½	15½	2,951
Central Oil.	25					7¼								125
Con. Mercur, g.	5	65		60		60		60		60		60		1,845
Copper Range	100	45½	45	45¼	44¼	44⅜	44	44½		46	44	46	44¼	2,020
Daly West, g. s. l	20	35		35		35	34⅝	35		35	34⅜	35		1,507
†Dominion Coal.	100	65	62	64	63½	63½	61	61	60	61	60	61		922
Preferred	100													
Dominion I. & S.	100						8½					8¼		100
Elm River, c.	12									2¼				500
Franklin, c.	25	8½	8⅜	8½	8⅜	8¼	8	8⅜		8¼				571
Granby Con.	10	3½	3⅜	3½	3¼									1,100
Guanajuato Con.	5					80		80						350
Isle Royal Con.	25	9		8						8				160
Mass Con., c.	25	4½				4				4¼	4	4¼		190
Mayflower, c.	25													
Michigan, c.	25	5		5¼	4⅝	5¼	5	5¼		5¼	5			1,080
Mohawk, c.	25	38	37½	37	35⅝	36¾	36½	37		37½	36¾	37½	38¼	1,010
Mont. Coal & C.	25													
Mont'l & Boston.	5													
New Idria, q.	5	10												5
Nova Scotia St.	100													
Preferred	100													
Old Colony, c.	25			1				1¾		1				70
Old Dominion, c.	25													
Osceola, c.	25			59⅞	58½	59¼	59	61		59⅞	59	60¾	60	283
Parrot, s. c.	10	22¾	22½	22¾	22					23⅛	20¾	29½	25	3,409
Phœnix Con, c.	25	2½				3								35
Quincy, c.	25			95						90		90		68
Rhode Island, c.	25													
Santa Fe, g. c.	10	2½		2⅛		2				2		2	1⅞	1,300
Shannon, c.	10	8¼	8¼	8⅜	8¼	8¼	8	8		8¼	8	8⅜	8	3,230
Tamarack, c.	25			106				106		114	113			67
Tecumseh, c.	25													
Tennessee, c.	25													
Trinity, c.	25	5		5	4⅞	5	4⅞	5		5⅛	5	5⅛	5	1,545
United c.	100													
United States, g.	10	20⅜	20⅛	20⅛	20⅛	20⅜	20	20⅛	20⅛	21¾	20½	21⅛	20¾	6,748
U. S. Coal & Oil.	25	9½		9½	9½	9½				9¼	9½			850
Utah Con., g. c.	5	33⅜	33	33	32½	33	32¼	33	32¼	34¾	32½	34⅛	33¼	8,870
Victoria, c.	25					3⅜		3½	3⅜	3½		3¼		460
Winona, c.	25					6⅝	6½	6½				6⅞		150
Wolverine, c.	25	72				72		72		72		73		199
Wyandot, c.	25			1		1		1						675

†Ex-dividend. ‡Assessment Paid. Total sales, 93,357 shares.
c—Copper g—Gold. l—Lead. q—Quicksilver. s—Silver.

Duluth, Minn. Jan. 30.

Company	Par Val.	Bid.	Asked.	Company	Par Val.	Bid.	Asked.
Calumet & Arizona	$10	$110	$111	Lake Sup. & Pitts.	$10	$130	$135
Calumet & Bisbee	10	7.50	8.00	Pitts. & Duluth	10	60.00	51.00
Calumet & Cochise	10	7.50	8.00	Shakespeare			.20
Calumet & Pittsburg	10	33.50	35.00	United Mexican			.50
Higgins Dev.	10	3.00		Wolv. & Arizona	10	4.00	
Junction Dev.	10	14.00	14.50	Yaqui	10		1.50

COAL, IRON AND INDUSTRIAL STOCKS.

Company.	Par val.	Jan. 27 H.	Jan. 27 L.	Jan. 28 H.	Jan. 28 L.	Jan. 29 H.	Jan. 29 L.	Jan. 30 H.	Jan. 30 L.	Feb. 1 H.	Feb. 1 L.	Feb. 2 H.	Feb. 2 L.	Sales
Allis-Chalmers	$100			8	7½	8¾	8¼			9				1,200
Preferred	100													
Am. Agr. Chem	100													
Preferred	100													
Am. Sm. & Ref.	100	51⅞	50⅜	51¼	50⅜	50¼	50	50	49½	50	49¼	50	49¼	17,910
Preferred	100	93¾	92¼	94½	93¾					93¼		93		8,500
Col. Fuel & I.	100	34½	31	34	31¾	32¼	32	31¾	31⅜	31		32	30¼	9,845
Preferred	10	65						50						128
Col. & H. C. & I.	100	16⅞	15¾	16¼	15	15⅛	15¼	15¼	15	14¾	14⅜			9,510
*Crucible Steel.	100	4		4		4		3¾		3⅞	3⅝	3⅝		1,405
*Preferred	100	27⅜	27¼	27⅜	27	27¼	26⅞	26¾	26¼	26¾	25½	26¼		1,043
General Chem.	100													
Preferred	100													
*Mong. R. Coal.	50													
*Preferred	100					25¼		25½				25¼		50
National Lead	100	16¾		15¾				15½		15½	15¼			500
Preferred	100	85¼						83	81¼					41
*Phila. Nat. Gas.	100													
*Preferred	100											45½		9
*Pittsburg Coal	100	14	13¾	13⅝		13⅜	13¼							955
*Preferred	100	51	49	49⅓	49	49		49¼	49			49		1,385
Republic I. & S.	100	8¼	8¼	8½	7⅞	7⅞	7⅜	7½		7¼				4,050
Preferred	100	47½	46⅜	46	45	45	44⅜			44¼	44			5,100
Sloss-Shef S. & I.	100	38		38	37	38		39	38¼	38		38½	38	2,040
Preferred	100											81		150
Standard Oil	100	668		665	664	665				662		662		94
Tenn. C.I. & R.R.	100	41	40¼	40⅜	38¾	38⅞	38½	38⅜	38	38	37¼	38	37	13,360
U.S. Red. & Ref.	100													
Preferred	100													
U.S.Steel Corp.	100	11⅛	11⅛	11⅝	11	11¼	11	11⅛	10⅝	10⅞	10⅜	10⅝	10⅜	51,275
Preferred	100	58⅞	58⅛	57⅞	56⅛	56½	55½	55W	54¼	55⅜	54¼	55⅜	54¾	289,005
Va.-Car Chem.	100	34	33¼	34⅜	33¼	33½	33½	34	33½	33¾	33¼	33⅜	33¼	10,555
Preferred	100											165½		10

*Pittsburg exchanges. Total sales, 428,100.

COLORADO SPRINGS, COLO.

Company.	Par Val	Jan. 23 H.	Jan. 23 L.	Jan. 25 H.	Jan. 25 L.	Jan. 26 H.	Jan. 26 L.	Jan. 27 H.	Jan. 27 L.	Jan. 28 H.	Jan. 28 L.	Jan. 29 H.	Jan. 29 L.	Sales
Acacia	$1	.09	.08	39½	.07¾	.09	.08	.09	.08	.09	.08	.08½	.08	4,000
American Con.	1													
Anaconda	5	.17	12½	.15	.13¼	.20	.15	.19	.16	.19	.15	.15		
Colo. City & M.	1	.03¼	.02¾	.04	.03½	.04	.03¾	.03⅜	.03	.02		.03½	.02⅝	18,000
C. K. & N.	1	.15½	.14½	.20	.14	.19	.15			.18	.15	.17⅝	.15	2,000
Cripple Ck. Con.	1	.08⅜	.08⅜	.09¼	.09	.08¼	.08	.07⅞	.07	.07¾	.07	.07¾	.07	45,500
Des Moines	1	.03		.02¾	.02	.02½	.02⅛	.02¼		.02¼		.02½	.02	9,000
Doctor Jack Pot.	1	.07¼	.06	.06	.07½	.10	.06	.07⅛		.07⅛		.08	.07	3,000
Elkton Con.	1	.57⅜	.56¾	.56½	.56	.57	.56¾	.57⅛	.56	.57½	.56	.57	.56	2,825
El Paso	1	.62¼	.62	.62	.61½	.62½	.62	.62	.61¾	.62	.61½	.62¼	.61½	11,100
Gold Dollar Con.	1	.05¾	.05⅛	.05¾	.05⅝	.05⅝	.05⅛	.06	.04⅝	.05	.04⅝	.04½	.04⅜	15,500
Gold Sovereign	1	.04⅜	.04⅛	.05	.04¾	.05	.04⅞	.04⅝	.04⅜	.04⅝	.04⅜	.04	.03⅞	29,000
Golden Cycle	1	.58	.56½	.56½		.57		.56½		.56½		.60	.56½	1,000
Golden Fleece	1	.06		.06		.06		.10		.10		.10		
Hart	1	.04	.02¾	.03¼	.03	.05	.03	.03½	.02¾	.03⅜	.02⅝	.03⅜	.02½	10,000
Isabella	1	.11	.10½	.11	.10½	.11¼	.11	.12	.11¼	.12	.11¼	.12½	.12	2,100
Jack Pot	1	.05		.06¼		.08	.07	.07	.06¾	.07	.06¾	.07	.06	4,000
Keystone	1	.04⅜	.4½	.05	.04⅜			.04½	.04¼	.04½	.04¼	.04½	.04⅜	20,000
Last Dollar	1	.50		.50		.50				.50		.50		
Lexington	1	.05	.01½	.05½	.05	.05	.04⅜			.04⅞	.04⅜	.04⅝	.04⅜	14,000
Little Puck	1	.03½	.02⅞	.04	.03½	.03¼	.03	.02½	.02¼	.02½	.02¼	.02½	.02	11,000
Mollie Gibson	1	.06		.05¼		.05		.05¼		.05¼		.05¼		
Moon-Anchor	5	.010	.09½	.10¾	.09⅝	.10½	.10	.10¼	.09½	.10¼	.09½	.10½	.09¾	5,000
New Haven	5	.04½	.04	.04½	.04	.04⅜	.04¼	.04	.03¾	.04	.03¾	.03¾	.03	8,500
Old Gold	1	.10	.08⅝	.09¼	.09	.09½	.08¾	.09¼	.08⅝	.09¼	.08⅝	.10	.08⅝	2,000
Pharmacist	1	.05	.04⅝	.05¼	.05	.05	.04¾	.04⅜	.04⅛	.04⅜	.04¼	.04⅜	.03½	7,000
Pinnacle	1	.05	.03½	.05	.03⅜	.03⅞	.03¼	.05	.04	.05	.04	.05	.04	2,500
Portland	1	1.57	1.35	1.80	1.57	1.80	1.56					1.80	1.50	500
Vindicator Con.	1	.70	.60	.70	.60	.61	.60	.60		.60		.85	.60¼	1,000
Work	1	.07½	.07⅜	.07¼	.07⅛	.07¼	.07	.07¼	.07	.07¼	.07	.07¾	.06¾	19,000
	1													

Total sales, 247,525 shares.

COLORADO SPRINGS (By Telegraph).

Company.	Feb. 1. H.	Feb. 1. L.	Feb. 2. H.	Feb. 2. L.
Anaconda	.18	.15	.17½	.14
Cripple Ck Con.	.08¾	.08	.08	.07½
C. K. & N.	.20	.18	.19½	.18
Doctor-Jack Pot.	.08	.07	.08½	.07¾
Elkton Con	.60	.57¼	.61	.59
El Paso	.62½	.61¼	.62	.61¾
Gold Dollar Con.	.05	.04¾	.05½	.05½
Gold Sovereign	.04¼	.04¼	.04½	.04⅜
Isabella	.17½	.13½	.22	.20

Company.	Feb. 1. H.	Feb. 1. L.	Feb. 2. H.	Feb. 2. L.
Jack Pot	.07	.06½	.08	.07
Last Dollar				
Mollie Gibson	.02¼	.01¾	.02½	.01¾
Moon Anchor	.10½	.09¾	.10½	.09¾
Old Gold	.09	.08¾	.08¾	.08¾
Pharmacist	.04½	.04	.04½	.04¼
Portland	1.80	1.50	2.00	1.72
Vindicator	.85	.60	.70	.60
Work	07¾	.07⅜	.07¾	.07⅜

SAN FRANCISCO.

Company.	Location.	Jan. 22 H.	Jan. 22 L.	Jan. 23 H.	Jan. 23 L.	Jan. 24 H.	Jan. 24 L.	Jan. 25 H.	Jan. 25 L.	Jan. 26 H.	Jan. 26 L.	Jan. 27 H.	Jan. 27 L.	Sales
Central Eureka	Cal							.80						500
Golden Anchor	Nev.	.24												500
Golconda	Ore.													
Hannapah	Nev.							.35	.25	.20				3,000
MacNamara	Nev.	.12												400
Mont. Tonopah	Nev.	1.30		1.32½	1.30			1.35		1.45	1.37½	1.50	1.40	14,732
South Eureka	Cal													
Ton. Belmont	Nev.	.69	.65	.67				.67	.65	.70	.68	.71		2,800
Ton. Midway	Cal	.41	.40	.40				.42	.39	.43		.47	.45	6,800
Ton. Mg. Co	Nev.	5.75	5.50											300
Ton. North Star	Nev.	.35		.35				.34	.33	.35	.33			3,550
Ton. & Salt Lake	Nev.									.25				400
Ton. Superior	Nev.	.55												200

San Francisco and Tonopah Mining Exchange.
Total sales, 33,782 shares.

SAN FRANCISCO (By Telegraph).

Company.	February 1.	February 2.
Belcher	.35	.37
Best & Belcher	1.70	2.35
Caledonia	1.05	1.15
Challenge Con.	.27	.28
Chollar	.23	.23
Confidence	1.00	1.05
Con. California & Virginia	1.60	1.60
Crown Point	.29	.29

Name of Company.	February 1.	February 2.
Gould & Curry	.32	.33
Hale & Norcross	.72	.73
Mexican	1.60	1.67
Ophir	3.70	3.80
Overman	.34	.38
Sierra Nevada	.62	.63
Union Con	.83	.83
Yellow Jacket	.48	.49

STOCK QUOTATIONS

MEXICO.* Jan. 22

Company.	Shares Issued.	Prices. Bid.	Ask.
Durango:			
Ca. Min. de Penoles	2,500	$3,800	$4,100
San Andres de la Sierra	200	10,000	.....
Guanajuato:			
Angustias, Pozos	2,400	45	50
Cinco Senores y An., aviadoras	2,000	70	75
Cinco Senores y An., aviada	400	73	75
Providencia, SanJuan de la Luz	6,000	60	70
Queensland y Australia	300	68	75
Guerrero:			
Delfina, 1st serie	2,500	62	80
Delfina, 2nd serie	2,500	37	45
Garduno y Anexas	7,200	40	50
Hidalgo:			
Amistad y Condordia	9,800	80	82
Carmen, aviada	1,100	120	150
Guadalupe Fresnillo Mill	1,000	160	250
Guadalupe Fresnillo Mine	1,400	70	80
La Blanca, aviadora	1,536	.....	.....
La Blanca, aviada	768	.....	.....
La Reina y An., aviadora	5,800	14	18
Luz de Maravillas, aviadas	1,100	.....	20
Maravillas y An., aviador	1,680	120	140
Maravillas el Lobo	1,000	130	180
Palma y An., aviador	1,800	11	19
Real del Monte	2,554	.....	.....
Refugio, aviada	12,800	5	7
Santa Anay An., aviadora	1,800	95	100
Santa Anay An., aviada	600	30	40
Sta. Gertrudis y An., aviadas	9,600	13	15
Sta. Gertrudis y An., aviadora	28,800	83	84
Santo Tomas Apostol aviadoras	5,100	2	3
San Felipe de Jesus, aviadora	3,600	17	19
San Felipe de Jesus, aviada	1,200	6	10
San Rafael y An., Trompillo	1,200	1,650	1,680
San Rafael y An., aviada	1,200	680	690
Soledad, aviada	980	680	710
Sorpresa, aviada	980	310	320
.....	.....	.....	.....

Name of Company.	Shares Issued.	Prices. Bid.	Ask.
Mexico:			
Alacran	2,400	40	50
Aldebarren	2,000	26	32
Buen Despacho	3,000	27	35
Dos Estrellas	3,000	2,050	2,075
La Esperanza (El Oro.)	3,000	1,500	1,600
La Reformia, aviadores	2,000	23	28
Providencia, pagadoras	1,000	.....	.....
Providencia, liberadas	900	.....	.....
Santa Ana, Esperanza	2,400	90	.....
Michoacan:			
Luz de Borda, aviadora	3,000	50	70
Luz de Borda, aviado	1,000	25	30
Santiago y An., Tial	4,000	6	11
Nuevo Leon:			
La Fraternal	1,000	580	620
Norias de Bajan	1,000	880	920
San Luis Potosi:			
Concepcion y An	3,000	80	85
El Barreno, aviadora	2,000	50	60
Sta. Maria de la Paz	2,400	165	175
San Diegoy Annexas	2,400	10	16
Zacatecas:			
Asturiana y An	2,500	50	68
Candelaria y Pinos	2,500	130	140
Cubiertas	2,400	.....	.....
Esperanza y An	2,400	6	8
Lourdes	2,500	25	32
Luz de Minillas, pagadoras	2,000	15	30
Nueva Quebradilla, aviadoras	2,400	95	105
Nueva Quebradilla, aviadas	600	70	80
San Carlos y Annexas	2,500	110	120
Sta. Maria de Gaud	2,500	67	70
Miscellaneous:			
Bartolome de Medina	2,000	78	80
Guadalupe Hacienda	20,000	.....	.....
La Luz Hac. (Pachuca.)	3,750	.....	.....
La Reina (Chihuahua.)	192	.....	.....
Naica (Chihuahua.)	100	11,000	13,000
Natividad (Oaxaca) aviadora	1,800	1,000	1,050
Natividad (Oaxaca) aviadas	600	.....	.....
San Francisco Hac	6,000	62	69
Santa Ana Huantla Morelos	4,000	.....	.....
Union Hacienda	3,000	215	230

*Values are in Mexican currency.

TORONTO, ONT. Jan. 29

Company.	Par val	Prices. High.	Low.	Sales
Black Tail, g	$1	.04	.02	.....
Cariboo-McKin	1	.06	.03	.....
Cariboo Hydr	1	.70	.....	.....
Center Star, g. s	1	.23½	.21½	.....
Crows Nest, C.C	100	2.60	2.00	.....
Dominion Coal	100	.65¼	.61	25
Dominion S. & I.	100	.08¾	.08¼	.....
Fairview, g. s	1	.04	.03¾	.....
Giant, g. s	1	.03½	.01	.....
Deer Trail, g. s	1	.02½	.01	.....
Iron Mask, g. s	1	.06	.....	.....
Morrison, g. s	1	.04	.02	.....
.....	.....	.....	.....	.....

Company.	Par val	Prices. High.	Low.	Sales
Granby Smelter	$10	4.25	3.75	.....
Mountain Lion, g.	1	.18	12	.....
North Star, g. s	1	.08	.....	.....
Nova Scotia Steel	100	.....	.....	.....
Payne, s. l	1	.16	.08	.....
Rambler Carib	1	.35	.24	.....
Republic, g	1	.03	.....	.....
St. Eugene, g. s	1	.40	.30	.....
Virtue, g. s	1	.07	.06	.....
War Eagle Con	1	.12	.10	.....
Sullivan, g. s	1	.06	.03	.....
Winnipeg, g. s	1	.04	.....	.....
Wonderful, g. s	1	.63	.....	.....

g—Gold. l—Lead. s—Silver. Total sales, 25.

SALT LAKE CITY.* Jan. 23

Company	Par Val	High	Low	Sales.
Ajax	10	.05½	.05	4,200
Butler Liberal	....	.10¼	.10¼	500
Carisa	1	.11	.10½	1,100
California	....	.00¾	.0 ¾	1,000
Century	1	.64½	.62½	7,500
Con. Mercur	1	.89	.96	200
Daly	5	2.50	2.25	215
Daly-Judge	1	3.40	3.30	1,210
Daly West	20	35.00	34.05	275
Grand Central	1	3.50	3.42½	250
Ingot	½	.02¼	.02	21,500
L. Mammoth	1	.41	.39½	900

Name of Company	Par Val	High	Low	Sales.
M. Washington	⅛	.01⅛	.00⅜	63,000
Manhattan	....	.01⅝	.00⅛	7,000
May Day	¼	.07½	.07¼	11,500
Mammoth	25	1.20	1.20	400
N. Y. Bonanza	1	.20	.16	5,700
Sacramento	5	.20¾	.20¼	10,100
Silver Shield	20	.03½	.03½	2,000
Star Con	1	.22¼	.20¾	8,800
Tetro	1	.31	.28¾	5,100
Uncle Sam Con	1	.23½	.22	2,800
Wabash	1	.05	.05	500
Yankee Con	1	.41½	.40	1,400

*By our Special Correspondent. All mines are in Utah. Total sales, 156,950 shares.

PHILADELPHIA, PA

Company.	Par val.	Jan. 27 H.	L.	Jan. 28 H.	L.	Jan. 29 H.	L.	Jan. 30 H.	L.	Feb. 1 H.	L.	Feb. 2 H.	L.	Sales
Am. Cement	$10	.....	.....	7⅛	7	.....	.....	.....	.....	.....	.....	.....	.....	48
Cambria Iron	50	47⅜	.....	.....	.....	47¾	.....	.....	.....	.....	.....	.....	.....	6
Cambria Steel	50	21	.....	21	20½	†20⅝	19¾	20	19½	19½	19⅛	19¼	.....	3,378
Pa. Steel, pfd	100	.....	.....	.....	.....	76	75	75	.....	.....	.....	.....	.....	48
Susq. I. & S.	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
United Gas I.	50	88¼	88	88	87½	87⅞	87⅛	87⅛	87	87	86	86½	86	3,562
Lehigh Nav'n	50	67	.....	67	66¾	.....	.....	.....	.....	66	.....	66¼	.....	118
Philadelphia	50	42⅛	.....	42⅛	41⅞	42	.....	.....	.....	41⅞	41⅝	.....	.....	1,182
U.S. Steel	100	11⅛	.....	11¼	11⅛	11	.....	11	.....	10⅝	10⅝	10⅝	10½	5,350
U.S. Steel pf.	100	58⅞	58	57¾	56¼	56⅝	55¾	55¾	55	55¼	54⅜	55⅜	54⅞	11,230

†Ex-Dividend Total sales 25,407.

LONDON. Jan. 22

Company.	Shares Issued.	Par value. £.	s.	d.	Latest dividend. Amt. s.	d.	Date.	Quotations. Buyers. £	s.	d.	Sellers. £	s.	d.
American:													
Alaska-Treadwell	200,000	5	0	0	1	6	Jan., 1904	4	10	0	4	15	0
Anaconda	1,200,000	5	0	0	2	0	Nov., 1903	3	15	0	3	17	6
Camp Bird	820,000	1	0	0		9	Feb., 1904	1	5	0	1	3	3
Copiapo	112,500	2	0	0	6	10	May, 1903	1	0	0	1	5	0
De Lamar	80,000	1	0	0	2	0	Oct., 1903		10	0		12	6
El Oro	1,080,000	1	0	0		9	Jan., 1904	1	5	0	1	7	6
Frontino & Bolivia	128,682	1	0	0	3	0	July, 1901		7	6		10	0
Le Roi	200,000	5	0	0	5	0	Nov., 1899		13	9		16	3
Le Roi No. 2	120,000	5	0	0	5	0	May, 1902		16	3		18	9
Montana	657,128	1	0	0		6	April 1899		1	6		2	0
Standard	500,000		4	0		2½	Sept., 1903		3	0		4	0
Stratton Independence	1,000,007	1	0	0		6	Dec., 1903		4	9		5	3
St. John del Rey	546,265	1	0	0		6	Dec., 1903		14	0		15	0
Tomboy	300,000	1	0	0	1	0	June, 1902	1	10	0	1	15	0
Utah	300,000	1	0	0	6	3	Jan., 1904	6	15	0	7	0	0
Ymir	200,000	1	0	0	1	0	Mar., 1902		3	9		6	3
European:													
Linares	15,000	3	0	0	1	0	Mar., 1903	2	10	0	3	0	0
Mason & Barry	185,172	1	0	0	11	0	May, 1903	3	10	0	3	15	0
Rio Tinto	325,000	5	0	0	32	6	Nov., 1903	50	0	0	50	5	0
Rio Tinto, preferred	325,000	5	0	0	2	6	Nov., 1903	5	17	6	6	2	6
Tharsis	625,000	2	0	0	6	0	May, 1903	4	10	0	4	15	0
West Australian:													
Associated	495,388	1	0	0	2	0	Jan., 1904	2	17	6	2	18	9
Cosmopolitan	400,000	1	0	0	1	0	May, 1903		15	0		15	6
Golden Horseshoe	300,000	5	0	0	6	0	Nov., 1903	8	17	6	9	0	0
Great Boulder	1,750,000		2	0		9	Dec., 1903	1	7	3	1	7	9
*Great Fingall	250,000	1	0	0	8	0	Jan., 1904	8	2	6	8	5	0
Ivanhoe	200,000	5	0	0	5	0	Jan., 1904	9	1	3	9	3	9
Kalgurli	120,000	1	0	0	2	6	Jan., 1904	5	13	9	5	18	3
Lake View	250,000	1	0	0	rts.		Aug., 1902	1	8	9	1	10	0
Oroya-Brownhill	450,000	1	0	0	2	6	Dec., 1903	3	13	9	3	16	3
Miscellaneous:													
*Brilliant Central	100,000	1	0	0	1	0	Jan., 1904	2	17	6	3	2	6
Briseis	600,000	1	0	0	..	..	.....		5	9		6	3
Broken Hill	980,000		8	0	1	0	Aug., 1903	1	8	6	1	9	6
Mt. Lyell	275,000	3	0	0	4	3	Sept., 1903		17	0		18	0
Mt. Morgan	1,000,000	1	0	0		3	Jan., 1904	2	2	6	2	7	6
Waihi	497,412	1	0	0	2	6	Dec., 1903	4	18	9	5	1	3
Indian:													
*Champion Reef	513,832		10	0	6	6	Jan., 1904	7	15	0	7	17	6
Mysore	596,043		10	0	4	4	Jan., 1904	6	13	9	6	16	3
Nundydroog	484,000		10	0	1	6	Nov., 1903	2	3	9	2	6	3
Ooregum	343,000		10	0		9	Dec., 1903	1	2	6	1	5	0
Ooregum, preferred	240,000		10	0	1	9	Dec., 1903	1	11	3	1	13	9
South African:													
Angelo	600,000	1	0	0	4	0	Jan., 1904	6	7	6	6	10	0
Bonanza	200,000	1	0	0	10	0	Feb., 1904	2	5	0	2	7	6
British South Africa	4,436,019	1	0	0	rts.		May, 1889	2	2	4	2	3	6
*Cape Copper	300,000	2	0	0	4	0	Jan., 1904	3	0	0	3	2	6
*Cape Copper, preferr'd	75,000	2	0	0	1	9	Jan., 1904	3	0	0	3	5	0
City & Suburban	340,000	4	0	0	8	0	Feb., 1904	6	7	6	6	12	6
Consol. Gold-Fields	2,000,000	1	0	0	..	..	.....	6	5	0	6	7	6
Crown Reef	120,000	1	0	0	20	0	Oct., 1903	17	0	0	17	10	0
De Beers	800,000	2	10	0	10	0	Jan., 1904	19	2	6	19	5	0
De Beers, deferred	1,000,000	2	10	0	15	0	Jan., 1904	20	2	6	20	5	0
East Rand	980,000	1	0	0	5	0	Aug., 1903	6	13	9	6	16	3
Ferreira	90,000	1	0	0	22	6	Feb., 1904	20	0	0	20	10	0
Geldenhuis	200,000	1	0	0	6	0	Feb., 1904	5	17	6	6	2	6
Geduld	400,000	1	0	0	rts.		Mar., 1902	6	6	3	6	8	9
Henry Nourse	125,000	1	0	0	10	0	Feb., 1904	8	12	6	8	17	6
Jubilee	50,000	1	0	0	5	0	Feb., 1904	4	12	6	4	17	6
Jumpers	100,000	1	0	0	5	0	Aug., 1899	2	17	6	3	2	6
Langlaagte	470,000	1	0	0	2	0	Feb., 1904	3	11	3	3	13	9
May	288,750	1	0	0	3	6	Feb., 1904	4	1	3	4	3	9
Meyer & Charlton	100,000	1	0	0	5	0	Jan., 1904	5	15	0	5	17	6
Modderfontein	290,000	1	0	0	rts.		Apr., 1902	8	8	9	8	11	3
Namaqua	94,331	2	0	0	3	0	Dec., 1903	2	17	6	3	2	6
New Jagersfontein	200,000	5	0	0	10	0	Dec., 1903	28	2	6	28	7	6
New Primrose	325,000	1	0	0	3	0	Jan., 1904	3	15	0	3	17	6
Rand	1,795,958		5	0	4	0	Aug., 1902	9	11	3	9	12	6
Robinson	750,000	5	0	0	5	6	Feb., 1904	9	15	0	10	0	0
Robinson Deep	950,000	1	0	0	3	0	Jan., 1904	5	7	6	5	10	0
Rose Deep	425,000	1	0	0	2	6	Feb., 1904	7	13	9	7	16	3
Salisbury	100,000	1	0	0	2	0	Mar., 1899	1	10	0	1	15	0
Sheba	1,075,000	1	0	0		6	July, 1899		10	0		12	6
Village	400,000	1	0	0	3	0	Feb., 1904	7	7	6	7	12	6
Wemmer	80,000	1	0	0	10	0	Jan., 1904	10	10	0	11	0	0

*Ex-dividend.

LONDON (By Cable.)*

Company.	Jan. 27 £.	s.	d.	Feb. 3 £.	s.	d.	Company.	Jan. 27 £.	s.	d.	Feb. 3 £.	s.	d.
Anaconda	3	5	0	3	12	6	El Oro, Mex	1	4	4½	1	3	9
British So. Africa	2	1	3	2	1	3	Modderfontein	8	7	6	8	4	4½
Camp Bird	1	6	0	1	6	6	Rand Mines	9	7	6	9	6	3
Con. Gold Fields	6	3	9	6	5	0	Rio Tinto	48	16	3	48	2	6
De Beers	19	16	3	20	2	6	Simmer & Jack	1	11	3	1	8	9
East Rand	6	11	6	6	11	3	Tomboy	1	12	6	1	11	3

*Furnished by Wm. P. Bonbright & Co., 15 Wall St., New York.

PARIS. Jan 21

Company.	Location.	Capital Stock.	Par value.	Latest divs.	Prices. Opening.	Closing.
		Francs.	Fr.	Fr.	Fr.	Fr.
Anzin, Coal	France	.....	.....	290.00	5,541.00	5,505.00
Boleo, c	Lower Cal	12,000,000	500	62.50	1,785.00	1,794.00
Champ d'Or, g	S. Africa	3,375,000	25	3.75	20.00	19.00
Courrieres, Coal	France	600,000	300	110.00	2,856.00	2,755.00
Fraser River, g	Brit. Col	250,000	25	.....	5.50	5.50
Huanchaca, s	Bolivia	40,000,000	125	5.00	77.00	74.25
Laurium, z. l	Greece	16,300,000	500	25.00	335.00	338.00
Malfidano, z	Italy	12,500,000	500	50.00	579.00	592.00
Metaux, Cie. Fran. de	France	25,000,000	500	22.50	482.00	484.00
Mokta-el-Hadid, i. l	Algeria	18,312,000	500	40.00	832.00	839.00
Nickel, n	N. Caledonia	15,000,000	250	22.50	514.00	512.00
Penarroya, Coal	Spain	.....	500	45.00	1,146.00	1,144.00
Vielle Montagne z	Belgium	9,000,000	30	30.00	684.00	685.00
Wyoming, o	California	.....	25	.....	328.00	331.00

c—Copper. g—Gold. i—Iron. l—Lead. n—Nickel. o—Oil. s—Silver. z—Zinc.

ST. LOUIS, MO.* Jan. 30

Name.	Par Val.	Prices. Bid.	Ask.	Name.	Par Val.	Prices. Bid.	Ask.
Am.-Nettie, Colo	$10	$0.25	$0.50	Columbia Lead, Mo.	$10	$3.00	$4.50
Catherine Lead, Mo.	10	.90	1.50	Con. Coal, Ill	100	19.00	21.00
Central Coal & C	100	57.50	59.00	Doe Run Lead Mo.	100	110.00	115.00
Central C. & C., pf.	100	68.00	70.50	Granite Bimet. Mt.	10	.42	.45
Central Lead, Mo	100	110.00	115.00	St. Joe Lead, Mo,	10	15.50	17.00

*By our Special Correspondent.

DIVIDENDS.

GOLD, SILVER, COPPER, LEAD, QUICKSILVER AND ZINC COMPANIES.—UNITED STATES.

Name and Location of Company.		Author-ized Capital Stock.	Shares. Issued.	Par Val	Dividends. Paid 1904.	Total to Date	Latest. Date.	Amt.
Acacia, g.	Colo.	$1,500,000	1,433,000	$1	0	$57,560	Apr. 1903	$0.01
Adams, s. l. c.	Colo.	1,500,000	150,000	10	.....	738,500	Oct. 1902	.05
Aetna Con., q.	Cal.	500,000	101,000	5	.....	325,000	Apr. 1900	.15
Alaska-Mexican, g.	Alaska.	1,000,000	180,000	5	$18,000	691,381	Jan. 1904	.10
Alaska-Treadwell, g.	Alaska.	5,000,000	200,000	25	75,000	5,350,000	Jan. 1904	.37½
Amalgamated, c.	Mont.	155,000,000	1,530,879	100	789,430	23,583,837	Feb. 1904	.50
Am. Sm. & Ref. Com	U. S.	50,000,000	500,000	100	625,000	625,000	Jan. 1904	1.25
Am. Sm. & Ref., pf.	U. S.	50,000,0 0	503,000	100	875,000	13,286,553	Jan. 1904	1.75
Anaconda, c	Mont.	30,000,000	1,200,000	25	.....	23,250,056	Nov. 1903	.50
Annie Laurie, g.	Utah	5,000,000	50,000	100	.....	285,000	Nov. 1903	.50
Arizona, c.	Ariz.	3,775,000	.....	...	.....	4,448,598	Nov. 1903	.....
Atlantic, c.	Mich.	1,000,000	40,000	25	.....	940,000	Feb. 1901	2.00
Bald Butte, g. s.	Mont.	250,000	200,000	1	25,000	1,337,148	Jan. 1904	.12½
Big Six., s. l.	Colo.	500,000	500 000	1	.....	17,500	Nov. 1903	.00½
Boston & Colo. Sm.	Colo.	750,000	15,000	50	.....	402,350	Oct. 1902	.75
Boston & Mont.	Mont.	3,750,000	150,000	25	300,000	28,625,000	Jan. 1904	2.00
Breece, l. s.	Colo.	5,000,000	200,000	25	.....	200,000	June 1903	.05
Bunker Hill & Sull.	Idaho	3,000,000	300,000	10	30,000	1,550,000	Jan. 1904	.10
Butler-Liberal, g. s.	Utah	500,000	500,000	1	.....	2,500	Dec. 1903	.00½
C. K. & N., g.	Colo.	1,500,000	1,431,900	1	.....	85,914	Sept. 1903	.01
Calumet & Arizona, c	Ariz.	2,500,000	200,000	10	.....	400,000	Dec. 1903	2.00
Calumet & Hecla, c.	Mich.	2,500,000	100,000	25	.....	83,350,000	Dec. 1903	10.00
Camp Bird, g.	Colo.	5,500,000	820,000	5	.....	967,704	Nov. 1903	.18
Cashier, g.	Colo.	1,000,000	950,000	1	5,940	23,760	Jan. 1904	.00½
Centennial Eureka.	Utah	5,000,000	100,000	25	.....	2,687,700	Jan. 1902	.50
Center Creek, l. z.	Mo.	1,000,000	100,000	10	.....	110,000	July. 1903	.10
Central Eureka, g.	Cal.	4,000,000	398,525	10	7,968	127,302	Jan. 1904	.02
Central, l.	Mo.	1,000,000	10,000	100	5,000	390,000	Jan. 1904	.50
Century, g. s. l.	Utah	150,000	150,000	1	3,000	12,000	Jan. 1904	.02
Champion, c.	Mich.	2,500,000	100,000	25	.....	100,000	May. 1903	1.00
ChippewaCon., g. s. l	Colo.	150,000	150,000	1	.....	2,500	Dec. 1902	.0½
Clinton, g. s.	Colo.	100,000	1,000	100	.....	60,000	Dec. 1903	.30
Con. Mercur, g.	Utah	5,000,000	1,000,000	5	.....	1,030,000	May. 1903	.03
Continental, z	Mo.	550,000	22,000	25	8,800	61,600	Jan. 1904	.40
Daly West, g. s. l.	Utah	3,000,000	180,000	20	117,000	3,714,000	Jan. 1904	.65
De Lamar, g. s.	Idaho	400,000	67,180	5	.....	2,740,340	Oct. 1903	.48
Deadwood-Stand. pf.	So. Dak	600,000	600,000	1	.....	6,000	Dec. 1903	.01
Doctor-Jack Pot, g.	Colo.	3,000,000	2,900,000	1	.....	232,000	Aug. 1901	.01
Doe Run, l.	Mo.	1,500,000	15,000	100	22,500	649,572	Jan. 1904	1.50
Elkton Con., g.	Colo.	3,000,000	2,500,000	1	.....	1,401,461	Mar. 1902	.04
Federal Sm., pf.	Idaho	20,000,000	105,000	100	.....	183,750	Dec. 1903	1.75
El Paso, g.	Colo.	900,000	810,250	1	4,051	59,351	Jan. 1904	.00½
Gemini, g. s. l.	Utah	500,000	5,000	100	.....	1,050,000	Dec. 1903	10.00
Gold Coin, g.	Colo.	1,000,000	1,000,000	1	.....	1,230,000	Jan. 1903	.01
Gold King,	Colo.	1,000,000	936,850	1	14,053	473,109	Jan. 1904	.01½
Golden Argus, g.	Cal.	800,000	8,000	100	.....	2,000	Dec. 1902	.25
Golden Cycle, g.	Colo.	2,000,000	1,500,000	1	.....	348,750	Aug. 1903	.03
Good Hope, g. s.	Colo.	50,000	500	100	.....	12,500	Jan. 1903	.25
Grand Central, g.	Utah	250,000	250,000	1	.....	916,250	Dec. 1903	.10
Gwin, g.	Cal.	1,000,000	100,000	10	.....	426,500	Dec. 1902	.15
Hecla, s. l.	Idaho	250,000	1,000,000	½	.....	120,000	June 1903	.02
Hecla Con., s. l.	Mont.	1,500,000	30,000	50	.....	2,930,550	Apr. 1902	.25
Homestake, g.	S. D.	21,840,000	218,400	100	54,600	12,422,350	Jan. 1904	.25
Horn Silver, g. s.c.z.l	Utah	10,000,000	400,000	25	.....	5,302,000	Dec. 1903	.05
Independence, g.	Colo.	2,500,000	2,500,000	1	.....	281,375	Apr. 1901	.04
Internat. Nickel, pf.	U. S.	12,000,000	87,415	100	.....	349,660	May. 1903	10.00
Iowa, g. s. l.	Colo.	1,666,667	1,666,667	1	16,667	333,504	Jan. 1904	.01
Iron Silver	Colo.	10,000,000	500,000	20	.....	2,850,000	Oct. 1903	.10
Jamison, g.	Cal.	3,900,000	390,000	10	11,700	132,600	Jan. 1904	.03
Kendall, g.	Mont.	2,500,000	500,000	5	50,000	355,000	Jan. 1904	.10
Kennedy, g.	Cal.	10,000,000	100,000	100	.....	1,801,001	June 1900	.05
La Fortuna, g.	Ariz.	250,000	250,000	1	.....	1,062,500	Oct. 1902	.05
Last Dollar, g.	Colo.	1,500,000	1,500,000	1	.....	210,000	Mar. 1903	.02
Liberty Bell, g.	Colo.	700,000	130,349	1	19,552	110,785	Jan. 1904	.15
Lightner, g.	Cal.	125,000	102,255	1	5,113	53,782	Jan. 1904	.05
Mary McKinney, g.	Colo.	1,000,000	1,000,000	1	.....	560,000	July. 1903	.03
May Day, g.	Utah	100,000	400,000	¼	.....	30,000	Mar. 1902	.01
Midget, g.	Colo.	1,000,000	1,000,000	1	.....	195,000	Apr. 1902	.15
Mine La Mott, l.	Mo.	3,300,000	300,000	10	60,000	300,000	Jan. 1904	.20
Mines Co. of Am.	U. S.	2,000,000	2,000,000	1	25,000	480,000	Jan. 1904	.01¼
Modoc, g. s.	Colo.	500,000	500,000	1	.....	260,000	Dec. 1903	.01
Mont. Ore Purch.	Mont.	2,500,000	81,000	25	.....	3,294,000	Sept. 1903	4.00
Mont.-Tonopah, g.	Nev.	1,000,000	885,000	1	.....	42,750	Dec. 1903	.05
Mountain, c.	Cal.	6,250,000	250,000	25	.....	3,776,250	May. 1903	.57
Napa Con., q.	Cal.	700,000	100,000	7	.....	1,180,000	Oct. 1902	.10
Nat. Lead, com.	U. S.	15,000,000	159,054	100	.....	1,341,486	Mar. 1900	1.00
Nat. Lead, pf.	U. S.	15,000,000	149,040	100	.....	13,972,168	Dec. 1903	1.75
New Idria, q.	Cal.	500,000	100,000	5	60,000	580,000	Jan. 1904	.60
New Jersey, z.	U. S.	10,000,000	100,000	100	.....	5,500,000	Nov. 1903	3.00
New Lead. Home.	Colo.	2,000,000	2,000,000	1	.....	265,500	Feb. 1902	.00⅝
North Star, g.	Cal.	2,500,000	250,000	10	.....	706,356	Dec. 1903	.50
Ontario. s. l.	Utah	15,000,000	150,000	100	.....	14,917,000	Dec. 1902	.30
Ophir, g s.	Nev.	302,400	100,800	3	25,200	1,621,000	Jan. 1904	.25
Osceola, c.	Mich.	2,500,000	96,150	25	96,150	4,343,450	Jan. 1904	1.00
Parrot, c.	Mont.	2,300,000	229,850	10	.....	5,772,935	Jan. 1902	.02
Pennsylvania, g.	Cal.	5,150,000	51,500	100	5,150	192,225	Jan. 1904	.10
Pioneer, g.	Alaska.	5,000,000	50,000	100	.....	300,000	Dec. 1902	6.00
Portland, g.	Colo.	3,000,000	3,000,000	1	180,000	4,837,080	Jan. 1904	.06
Pride of the West	Ariz.	1,500,000	150,000	10	.....	15,000	Oct. 1902	.10
Quicksilver, pf.	Cal.	4,300,000	43,000	100	.....	1,931,411	May. 1903	.50
Quincy, c.	Mich.	2,500,000	100,000	25	250,000	14,370,000	Feb. 1904	2.50
Red Bird, g. s. c. l.	Mont.	1,500,000	300,000	5	.....	36,000	Dec. 1903	.01
Rob Roy, z.	Mo.	15,000	13,825	1	277	2,530	Jan. 1904	.02
Rocco-Home. Nev.	Nev.	300,000	240,000	1	.....	90,000	Nov. 1902	.01
Sacramento, g.	Utah	5,000,000	1,000,000	5	.....	193,000	Dec. 1903	.00½
St. Joseph, l.	Mo.	6,000,000	375,000	10	.....	3,834,500	Dec. 1903	.15
Silver Hill, g. s.	Nev.	180,000	180,000	1	9,000	37,800	Jan. 1904	.05
Silver King, g. s. l.	Utah	3,000,000	150,000	20	100,000	7,450,000	Jan. 1904	66⅔
Smuggler, s. l. z.	Colo.	1,000,000	1,000,000	5	.....	2,175,000	Feb. 1902	.01
Spearfish, g. pf.	So. Dak	1,000,888	882,000	1	.....	87,020	Nov. 1903	.01
Specie Payment, g.	Colo.	1,000,000	1,000,000	1	.....	40,190	Oct. 1902	.01
Standard Con., g. s.	Cal.	2,000,000	178,394	10	.....	4,178,170	Dec. 1903	.10
Standard, c.	Ariz.	500,000	500,000	1	.....	40,000	Sept. 1903	.05
Stratton's Independ.	Colo.	5,500,000	1,000,007	5	.....	4,130,860	Dec. 1903	12½
Swansea, s. l.	Utah	500,000	100,000	5	.....	330,500	June 1902	.05
Syndicate, g.	Cal.	100,000	100,000	1	.....	82,000	Aug. 1902	.02
Tamarack, c.	Mich.	1,500,000	60,000	25	90,000	8,580,000	Jan. 1904	1.50
Tennessee c.	Tenn.	5,000,000	175,000	25	218,750	437,500	Jan. 1904	1.25
Tomboy, g. s.	Colo.	1,500,000	300,000	5	.....	1,244,000	July. 1902	.24
Tonopah-Alpine, g.	Nev.	700,000	700,000	1	.....	70,000	Dec. 1903	.10
Town Topics, g. s.	Colo.	1,000,000	1,000,000	1	.....	50,000	Nov. 1903	.00½
Trinity County, g.	Cal.	1,000,000	99,003	10	.....	34,561	July. 1903	.05
United, (Creede) g.	Colo.	500,000	500,000	1	.....	45,000	May. 1904	.02
Union, g.	Colo.	1,250,000	1,250,000	1	.....	445,244	Jan. 1903	.02
United, c. pf.	Mont.	5,000,000	50,000	100	.....	450,000	Nov. 1903	3.00
United, Cripple Ck. g.	Colo.	5,000,000	3,994,769	1	.....	319,933	Jan. 1902	.01
United, z. l., com.	Mo.	5,000,000	78,900	7	.....	30,725	Oct. 1903	.05
United, z. l. pf	Mo.	1,000,000	18,986	25	.....	125,356	Oct. 1903	.50
United Verde, c.	Ariz.	3,000,000	300,000	10	225,000	15,285,322	Jan. 1904	.75
U. S. Red. & Ref., com	Colo.	6,000,000	59,188	100	.....	414,078	Oct. 1903	1.00
U. S. Red. & Ref., pf.	Colo.	4,000,000	39,458	100	.....	472,821	Oct. 1903	1.50
Utah, g.	Utah	1,000,000	100,000	10	.....	221,000	Dec. 1903	.01
Utah Con., c.	Utah	1,500,000	300,000	5	450,000	2,136,000	Jan. 1904	1.50
Vindicator Con., g.	Colo.	1,500,000	1,100,000	1	.....	1,115,000	Oct. 1903	.03
Waldorf, g.	Colo.	3,000,000	3,000,000	1	.....	47,000	July. 1903	.00¼
Wasp No. 2, g.	So. Dak	500,000	147,900	1	.....	218,410	June 1902	.00½
Wolverine, c.	Mich.	1,500,000	60,000	25	.....	1,320,000	Oct. 1903	3.00
Yankee Con., g. s. l.	Utah	500,000	500,000	1	.....	75,000	Apr. 1902	.05
Yellow Aster, g.	Cal.	1,000,000	100,000	10	.....	553,789	Dec. 1903	.10

COAL, IRON AND INDUSTRIALS.

Name and Location of Company.		Author-ized Capital Stock.	Shares. Issued.	Par Val	Dividends. Paid 1904.	Total to Date.	Latest. Date.	Amt.
Ala. Con., C. & I., pf	Ala.	$2,500,000	$24,638	$100	.....	$689,680	Dec. 1903	$1.75
Ala. & Ga. Iron, pf.	Ala.	650,000	6,500	100	.....	6,500	Jan. 1903	1.00
Allis-Chalmers, pf.	U. S.	25,000,000	200,000	100	$350,000	3,213,750	Feb. 1904	1.75
Alma Oil.	Cal.	400,000	380,000	1	.....	45,600	Dec. 1903	.02
Amer. Agr. Chem., pf.	U. S.	20,000,000	181,350	100	.....	4,670,760	Oct. 1903	3.00
American Cement.	Pa.	2,100,000	200,000	10	80,000	620,000	Jan. 1904	.40
American Coal.	Md.	1,500,000	50,000	25	.....	1,432,500	Sept. 1903	1.25
Aztec Oil.	Cal.	250,000	235,000	1	.....	43,050	Sept. 1903	.03
Bon Air C. & I., pf.	Tenn.	2,500,000	18,803	100	28,250	28,250	Jan. 1904	1.50
Cambria Steel.	Pa.	50,000,000	900,000	50	675,000	7,125,000	Feb. 1904	.75
Central C. & C., com.	Mo.	5,125,000	51,250	100	76,875	628,125	Jan. 1904	1.50
Central C. & C., pf.	Mo.	1,875,000	18,750	100	23,437	820,309	Jan. 1904	1.25
Central Oil	W. Va.	1,500,000	60,000	25	15,000	167,500	Feb. 1904	.25
Colo. Fuel & I., com	Colo.	38,000,000	239,310	100	.....	1,642,500	Apr. 1902	1.75
Colo. Fuel & I., pf.	Colo.	2,000,000	20,000	100	.....	1,560,000	Feb. 1903	4.00
Colum. & Hock. C. & I	Ohio.	7,000,000	69,244	100	17,311	103,842	Feb. 1904	.25
Consolidated Coal.	Ill.	5,000,000	50,000	100	.....	150,000	Jan. 1903	1.00
Consolidation Coal.	Md.	10,250,000	102,500	100	410,000	6,946,650	Feb. 1904	4.00
Crucible Steel, pf.	U. S.	25,000,000	250,000	100	.....	5,250,000	Sept. 1903	1.75
Cummings Cement.	N. Y.	300,000	3,000	100	.....	216,000	July. 1903	9.00
Dabney Oil.	Cal.	1,000,000	1,000,000	1	.....	145,000	Oct. 1903	.00⅝
Empire S. & I., pf.	U. S.	5,000,000	23,700	100	.....	367,350	July. 1903	1.00
Fairmont Coal.	W. Va.	12,000,000	120,000	100	240,000	240,000	Feb. 1904	2.00
Four Oil.	Cal.	300,000	208,700	1	2,087	58,449	Jan. 1904	.01
General Chem., com	U. S.	12,500,000	74,103	100	.....	1,300,537	Dec. 1903	1.25
General Chem., pf.	U. S.	12,500,000	100,000	100	150,000	2,716,418	Jan. 1904	1.50
Giant Oil.	Cal.		500,000	1	.....	5,000	Jan. 1903	.01
Heywood Oil.	Tex.		800,000	1	.....	144,000	Jan. 1903	.02
Higgins Oil.	Tex.		2,500,000	100	.....	96,850	Apr. 1902	1.50
Home Oil.	Cal.		100,000	1	.....	492,500	June 1903	.06
Homestake Oil.	Cal.		100,000	10	.....	33,000	Aug. 1902	.15
Houston Oil, pf.	Tex.		7,500,000	100	.....	886,500	Feb. 1903	3 00
Imperial Oil.	Cal.		1,000,000	100	20,000	520,000	Jan. 1904	20
Int'l Acheson, pf.	N. Y.		500,000	100	.....	105,000	July. 1903	3.50
Jeff. & Cl'f. C. & I. com.	Pa.		1,500,000	100	.....	180,000	Aug. 1903	5.00
Jeff. & Cl'f. C. & I., pf.	Pa.		1,500,000	100	37,500	638,000	Feb. 1904	2 50
Lehigh Coal & Nav.	Pa.		14,346,650	286,933	50	20,688,986	Nov. 1903	1.50
Maryland Coal, pf.	Md.		2,000,000	18,850	100	1,046,135	Dec. 1903	5 00
Monong. R. Coal, pf	Pa.		10,000,000	97,300	5	347,165	3,471,510	Jan. 1904	3.50
Monte Cristo Oil.	Cal.		500,000	500,000	1	.....	35,000	Nov. 1903	.01
National Carbon, pf.	U. S.		4,500,000	45,000	100	78,750	1,653,750	Feb. 1904	1 75
Ohio & Ind. Gas.	U. S.		10,000,000	800,000	100	.....	1,440,000	Dec. 1903	1.00
Pacific Coast Borax.	Cal.		2,000,000	19,000	100	19,000	1,554,500	Jan. 1904	1.00
Peerless Oil.	Cal.		1,000,000	92,000	10	.....	190,400	Dec. 1903	.14
Penna. Salt	Pa.		2,500,000	50,000	50	.....	13,450,000	Oct. 1903	7 00
Penna. Steel	Pa.		25,000,000	168,214	100	.....	3,505,750	Nov. 1903	3.50
Phila. Gas, com.	Pa.		16,102,131	308,542	50	231,406	3,648,237	Feb. 1904	.75
Phila. Gas, pf.	Pa.		3,998,350	212,873	50	.....	1,009,067	Sept. 1903	1.25
Pittsburg Coal, pf.	Pa.		32,000,000	297,012	100	519,771	8,836,107	Jan. 1904	1.75
Pittsburg Oil.	Cal.		300,000	240,000	1	.....	48,000	Dec. 1903	02½
Pocahontas Coll., pf	W. Va.		1,500,000	15,000	100	.....	90,000	Dec. 1903	.50
Rep. Iron & Steel, pf	U. S.		25,000,000	204,109	100	.....	6,053,476	Oct. 1903	1.75
San Joaquin Oil.	Cal.		100,000	100,000	1	220,000	405,000	Jan. 1904	2.20
Shelby Iron.	Ala.		1,000,000	10,000	100	.....	840,000	Nov. 1903	6.00
Sloss-Sheffield, pf.	Ala.		20,000,000	65,085	100	114,000	1,824,000	Jan. 1904	1 75
Somerset Coal.	Pa.		4,000,000	40,000	100	80,000	80,000	Feb. 1904	2.00
St. Bernard C. & C.	Ky-Ten.		1,000,000	10,000	100	.....	770,000	Dec. 1903	6.00
Standard Oil.	U. S.		100,000,000	970,000	100	.....	206715,000	Dec. 1903	12.00
SundayCreek Coal, pf	Ohio		150,000	1,500	100	.....	15,750	Aug. 1903	3.00
Susq. I. & S., pf.	Pa.		1,500,000	300,000	5	.....	762,500	June 1903	3 15
Temple Iron.	Pa.		240,000	2,400	100	.....	21,500	July. 1903	2.00
Tenn. C. I., com.	Tenn.		23,000,000	225,533	100	.....	1,102,600	Nov. 1900	2.00
Tenn. C. I., pf.	Tenn.		248,000	2,480	100	4,960	312,064	Feb. 1904	2 00
Thirty-three Oil.	Cal.		500,000	100,000	5	10,000	250,000	Jan. 1904	.10
Thomas Iron.	Pa.		2,500,000	25,000	200	.....	200,000	Aug. 1903	4 00
Tidewater Steel, pf.	Pa.		600,000	60,000	1	.....	30,000	July. 1903	.20
Union Oil.	Cal.		10,000,000	52,672	100	.....	370,870	Oct. 1903	.70
U. S. Steel Corp., com	U. S.		550,000,000	5,084,952	100	.....	53,360,978	Dec. 1903	1 50
U. S. Steel Corp., pf.	U. S.		550,000,000	3,603,141	100	6,305,497	99,182,490	Feb. 1904	1.75
Va.-Carolina Ch., com	U. S.		38,000,000	279,844	100	.....	3,678,829	June. 1903	1 25
Va.-Carolina Ch., pf.	U. S.		2,000,000	120,000	100	240,000	7,260,839	Jan. 1904	2.00
Westmoreland Coal.	Pa.		5,000,000	250,000	50	.....	8,250,000	Sept. 1903	.50
West Shore Oil.	Cal.		100,000	100,000	1	.....	105,000	Dec. 1903	.05
.....	.....		.....	.....	.....	.....	.....	.....	.....
.....	.....		.....	.....	.....	.....	.....	.....	.....

CANADA, CENTRAL AND SOUTH AMERICA, MEXICO.

Name and Location of Company.		Author-ized Capital Stock.	Shares. Issued.	Par val	Dividends. Paid 1904.	Total to Date.	Latest. Date.	Amt.
Amistad y Con., g s.	Mex.	$480,000	9,600	$50	$85,256	$165,286	Oct. 1903	$1.08
Barreno, g. s.	Mex.	.....	2,400	...	.....	63,946	June 1903	.86
Bart. de Medina Mill	Mex.	50,000	2,000	25	2,640	82,368	Jan. 1904	1.32
Buena Vista, g. s.	Mex.	100,000	1,000	100	.....	5,000	June 1903	5.00
Butters' Salvador, g.	Salv.	750,000	150,000	5	.....	252,000	Dec. 1903	.24
Cariboo McKin'y, g.s.	B. C.	1,250,000	1,250,000	1	.....	496,837	Mar. 1902	.01½
Carmen, g, s.	Mex.	27,500	1,100	25	.....	78,616	Nov. 1903	.80
Carmen-Guanaj. g. s.	Mex.	725,000	145,000	5	.....	27,750	Oct. 1903	.12½
Cinco Senores.	Mex.	.....	2,000	...	.....	711,935	July. 1903	4.10
Copiapo c.	Chile	1,125,000	112,500	10	.....	2,865,900	Feb. 1903	.36
Dominion Coal. pf.	N. S.	3,000,000	30,000	100	.....	2,340,000	July. 1903	2.00
Dominion I. & S. pf.	N. S.	5,000,000	50,000	100	.....	875,000	Sept. 1903	3.50
Dos Estrellas, g. s.	Mex.	150,000	3,000	50	13,200	596,025	Jan. 1904	4.40
El Oro, g. s.	Mex.	5,750,000	1,080,000	5	.....	2,514,400	Dec. 1903	.18
Esperanza, s. g.	Mex.	2,275,000	455,000	5	.....	1,154,189	Aug. 1903	4.40
Fraternal, s.	Mex.	5,000	1,000	5	.....	51,263	Nov. 1903	2.18
Granby, Con.	B. C.	13,363,030	1,336,303	10	.....	133,630	Dec. 1903	.10
Greene Con., c.	Mex.	7,200,000	720,000	10	.....	651,820	May. 1903	.20
Guadalupana, g. s. l.	Mex.	15,000	3,000	5	.....	69,930	Mar. 1903	.77
Guadalupe	Mex.	1,000,000	10,000	100	.....	3,515,750	Apr. 1903	.77
Le Roi No. 2. g.	B. C.	3,000,000	120,000	35	.....	288,000	May. 1902	1.20
Mesquital, g. s.	Mex.	125,000	250,000	½	.....	51,458	Feb. 1903	.06
Natividad, s. g.	Mex.	36,000	2,400	15	12,000	284,463	Jan. 1904	5.00
N. Y. & Hond. Ros.	C. A.	1,500,000	150,000	10	.....	1,785,000	Dec. 1903	.10
North Star, s. l.	B. C.	1,500,000	1,300,000	1	.....	581,356	Dec. 1902	.01
N. S. St. & Coal, com.	N. S.	5,000,000	41,200	100	.....	515,000	Oct. 1903	3.00
N. S. St. & Coal, pf.	N. S.	2,000,000	10,300	100	20,600	226,600	Jan. 1904	2.00
Providence, g. s.	B. C.	200,000	5,560	5	.....	2,224	Dec. 1903	.10
Providencia (S. J.).	Mex.	90,000	6,000	15	.....	169,740	Feb. 1903	.77
Rambler-Cariboo, s. l.	B. C.	1,250,000	1,250,000	1	.....	230,000	Nov. 1902	.01½
Real del Monte,	Mex.	.....	2,554	...	.....	2,926,584	Nov. 1903	4.30
Soledad, s. l.	Mex.	19,200	960	20	4,205	268,917	Jan. 1904	4.38
Sorpressa, g. s.	Mex.	19,200	960	20	2,112	202,178	Jan. 1904	2.20
San Francisco Mill.	Mex.	60,000	6,000	25	.....	284,760	Nov. 1902	.40
San Rafael.	Mex.	60,000	2,400	25	23,100	1,898,320	Jan. 1904	.....
Sta. Gertrudis, g. s.	Mex.	1,920,000	38,000	50	.....	2,780,448	Dec. 1903	.....
St. John del Rey, g.	Brazil	3,000,000	546,295	5	.....	14,158,949	Dec. 1903	.12
Sta. Maria de la Paz.	Mex.	.....	2,400	...	.....	1,962,373	Dec. 1903	2.20
Torreon Metall.	Mex.	1,500,000	30,000	50	.....	289,500	Apr. 1903	8.98
Union Mill.	Mex.	150,000	3,000	50	5,280	418,703	Feb. 1904	1.76
Ymir, g.	B. C.	1,000,000	200,000	5	.....	288,000	Mar. 1902	.23

NOTE.—These dividends are published gratuitously. Readers are invited to send any additions or corrections which they think necessary to complete our list.